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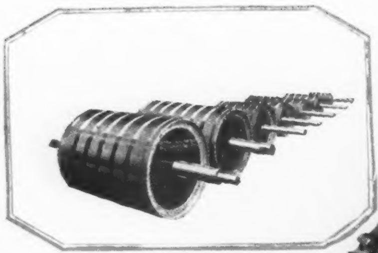

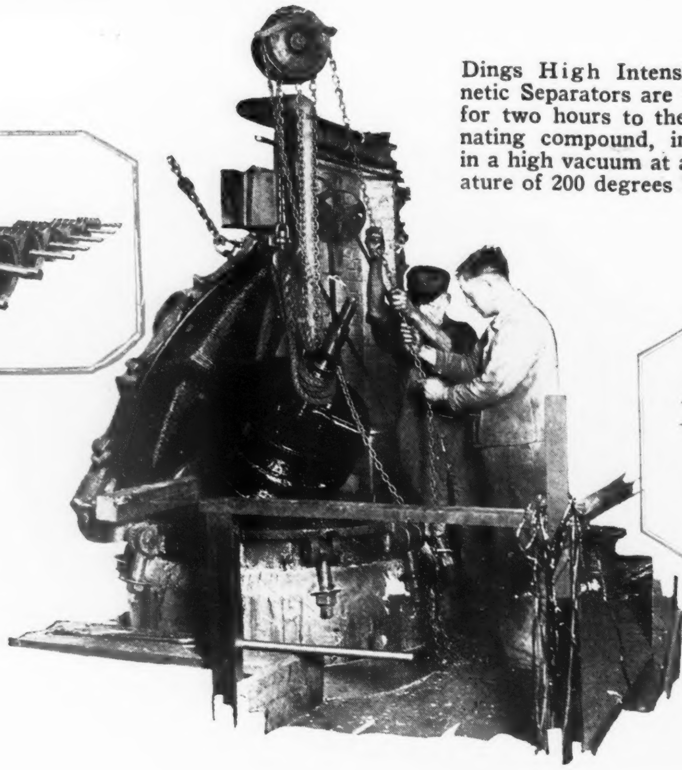

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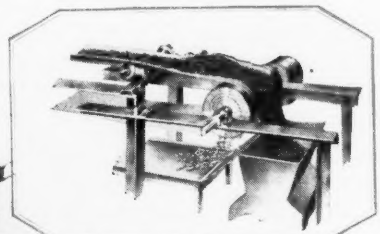

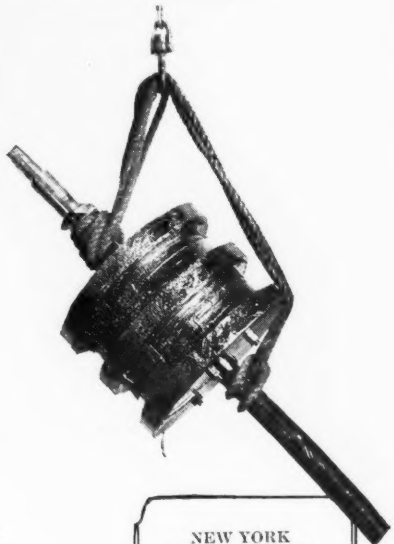

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Rock Products

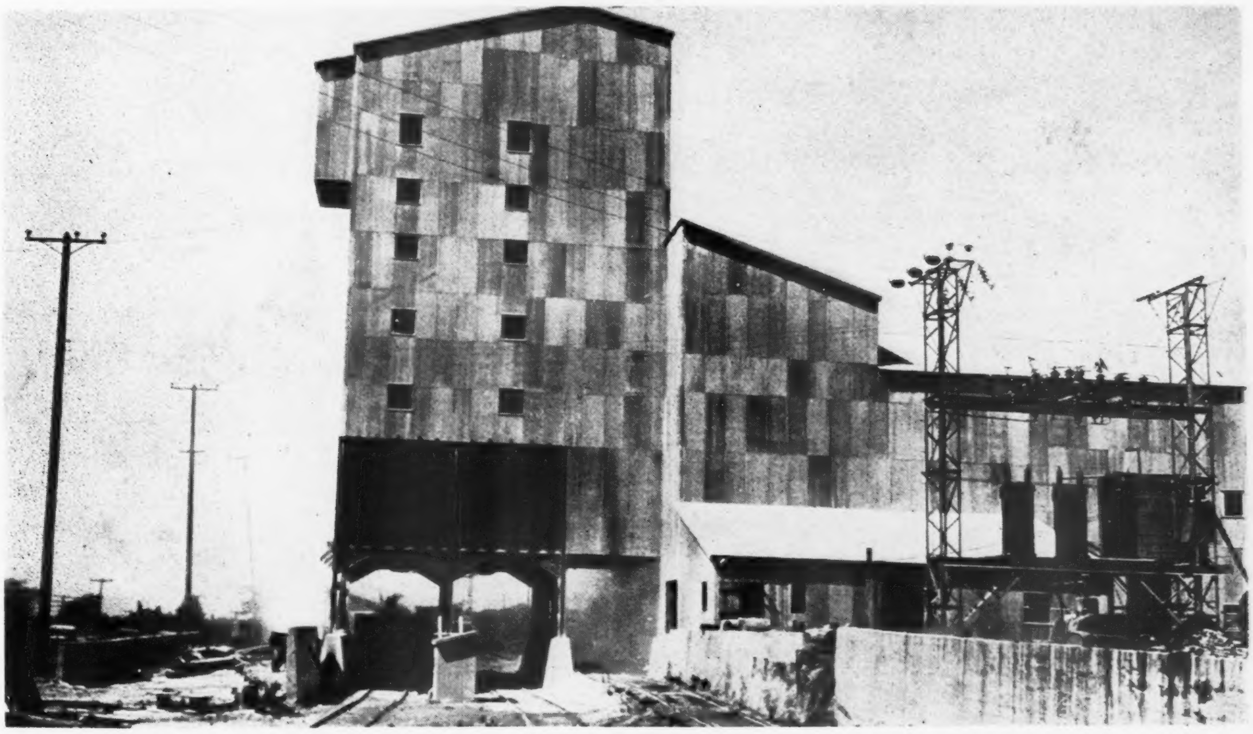
Volume XXVII | Chicago, September 6, 1924 | Number 18

New All-Steel Crushing Plant of Mid-West Crushed Stone Company

Good Example of the Type of Quarry Plant Replacing Old Wood Structures

By F. A. Alter
Of Rock Products Staff

ON JANUARY 15, 1924, the Greencastle, Ind., plant of the Mid-West Crushed Stone Co. was almost destroyed by fire, the only salvage being the secondary crushers. Just six and one-half months from that day, or on July 30, a new plant built of structural steel had been constructed and was operating. This new plant represents the manager, collaborating with engineers of the Worthington Pump and Machinery Corp., designed the plant, and Hetherington & Berner, of Indianapolis, fabricated and erected the structural steel. The walls and roof of the plant are covered with pure corrugated zinc furnished by the American Zinc Products Co. of Greencastle, Ind. but rather to the quarry equipment. The stone in the vicinity of Greencastle is a very high calcium limestone, most of it in fact running well over 96%. It is well adapted for railway ballast, general construction, and for agricultural limestone. The market for the latter is rapidly being extended, especially in the vicinity of the



Side view of plant showing truck and railroad bins. Outside walls are covered with pure zinc corrugated sheets

very latest ideas in modern crushed stone plant design.

It is located on the site of the old plant, about a mile from the center of town, and on a branch of the Pennsylvania railroad. It is practically fireproof with the exception of wooden stairways. E. B. Taylor, general

Original designs called for a production of 250 tons per hour but the best production to date has been 1500 tons for a 15-hour day or 100 tons per hour. This figure was attained with a crew of 60 men. Limitation in present production is not due to the crushing and screening plant

plant. The company is now doing a considerable local truck business.

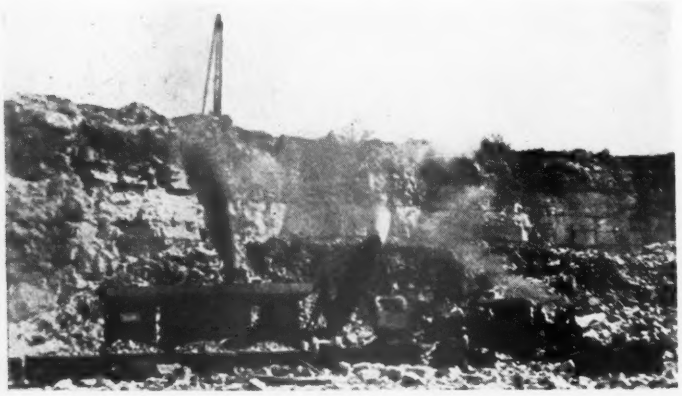
Quarry Operation

The quarry has been operated to the extent of about half a square mile and to a depth of 35 ft. The average overburden is

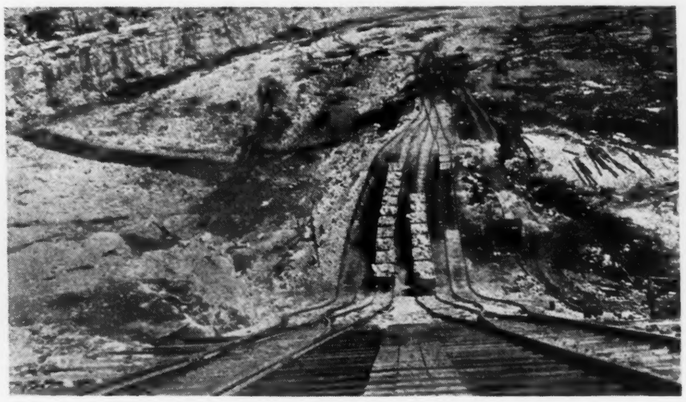
about 4 ft., and in stripping this overburden a No. 60 Marion steam shovel equipped with a 2½-yd. dipper is used. Dirt is loaded into eight 4-ton side-dump cars and is hauled by two Davenport 18-ton 48-in. steam locomotives to a dump about a half a mile away from the quarry.

Two Loomis drills, electrically driven, are used in the quarry for blasting. Under average conditions a blast a month suffices for the needs of the plant. Whatever "pop shooting" is necessary is done with jackhammer drilling.

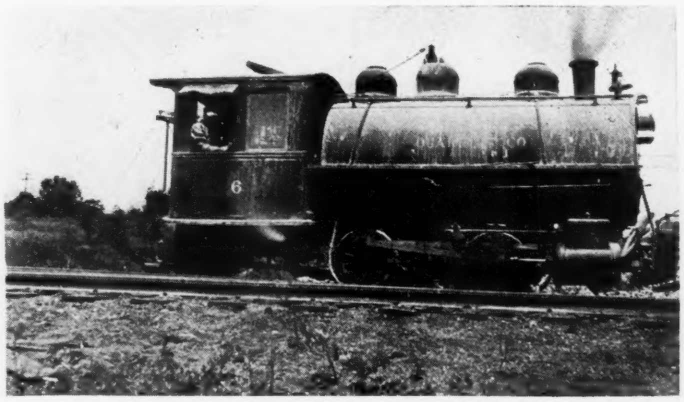
For loading in the quarry, a Marion No. 40 steam shovel equipped with a 1½-yd. dipper is used. This shovel is considered of too small capacity for the present crushing and screening plant, and the purchase of a new larger steam shovel is contemplated in the near future. The shovel loads into 3-ton, end-dump steel cars of the company's own design and manufacture. They are hauled to the incline at the foot of the crushing plant by a 15-ton Shay geared locomotive which has been in operation over 15 years. The average haul of this locomotive is about 10 cars or 30 tons.



Left—Loading quarry cars. Right—Steam shovel stripping



Left—Incline from quarry to primary crushing plant. Right—Looking down the incline at cars ready to be hoisted. Note track layout and water tank



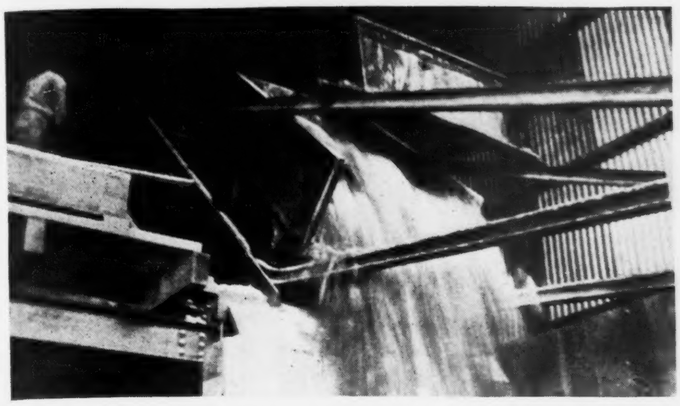
Left—A general view of the quarry. Right—Type of locomotive used for switching

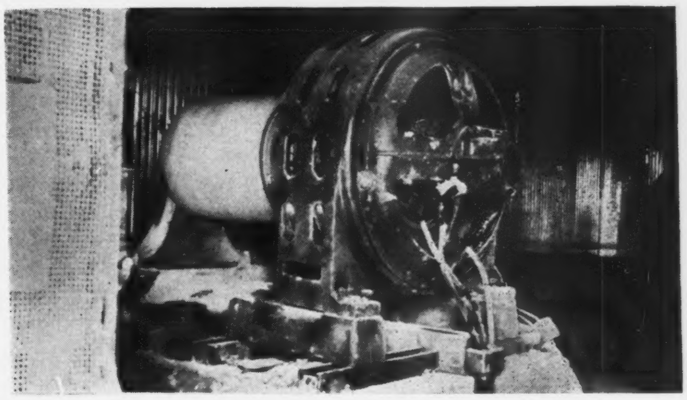
Feeding the Crushers

The incline, which is about 250 ft. long, has two narrow-gage tracks each with a switch and siding, or passing track. Loaded cars from the train are hauled to the primary crusher, singly, with a Worthington double-action, single-drum hoist of 5 tons capacity. There is a hoist complete for each track using a ⅝-in. steel cable. The cars are dumped by means of the device shown in the accompanying photographs.

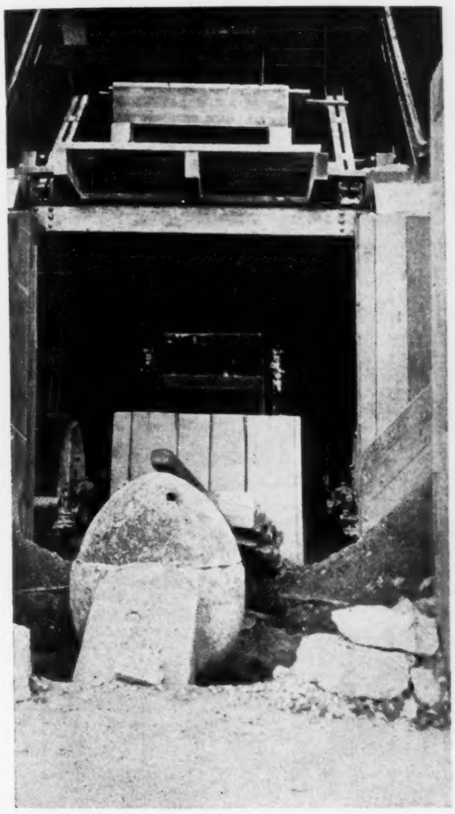
Empties are sent down the track and switched on to the empty branch of the Y switch. It will be observed from a glance at the track layout that it is possible for one locomotive to handle the entire hauling necessary to and from the foot of the incline, and this is being done by the Shay.

The cars dump directly into a No. 30 McCully gyratory crusher. This crusher can handle anything that the shovel can load. It is rated to crush 250 tons of stone per hour from 30 in. to 3½ in. A 20-ton Peer-



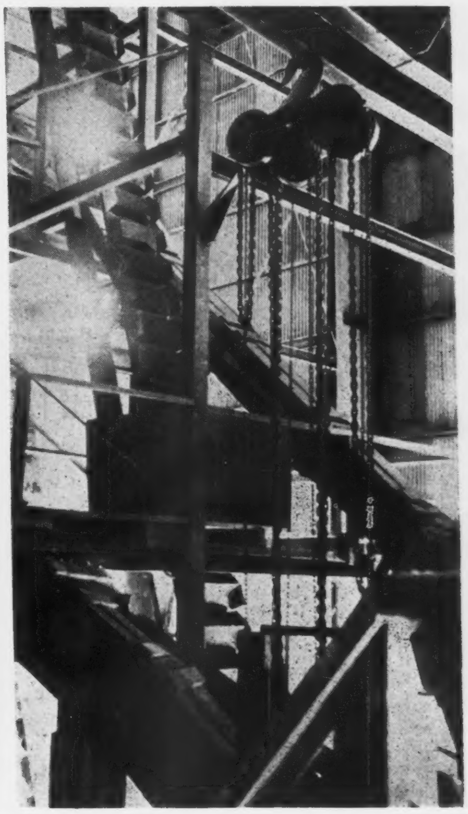


Left—Special steel dump car unloading at the plant. Right—The 500-hp. motor which drives the plant through a 42-in. belt

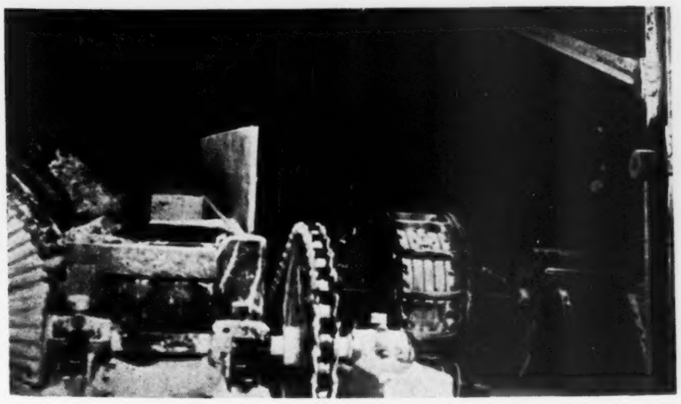


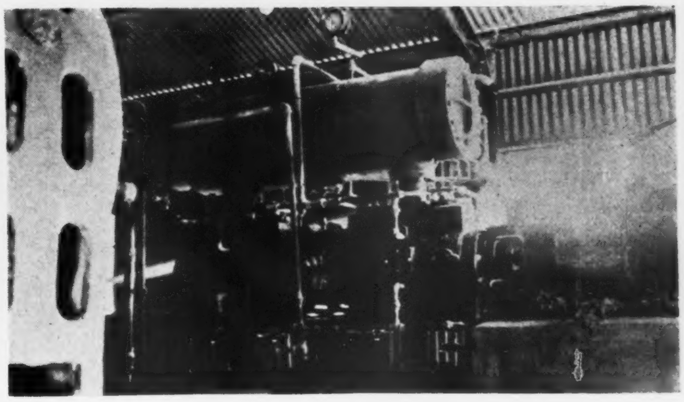
Head of No. 30 gyratory crusher

A 60-in. by 15-ft. "Hex" screen



Chain hoist over crusher





Left—The 150-hp. motor which drives part of secondary crushing and screening plant and a 48-in. by 10-ft. screen. Right—Air compressor which supplies air for drills and other machines

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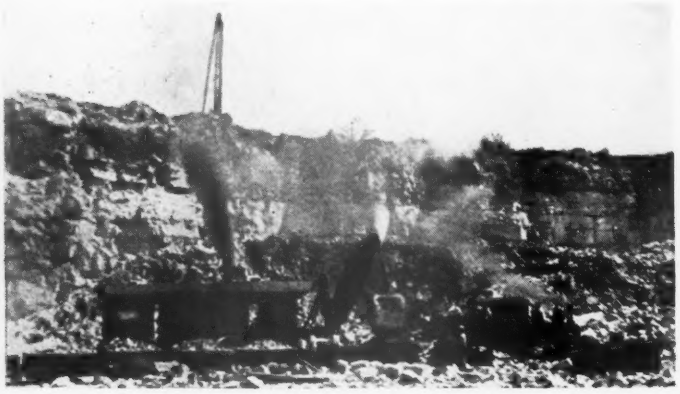


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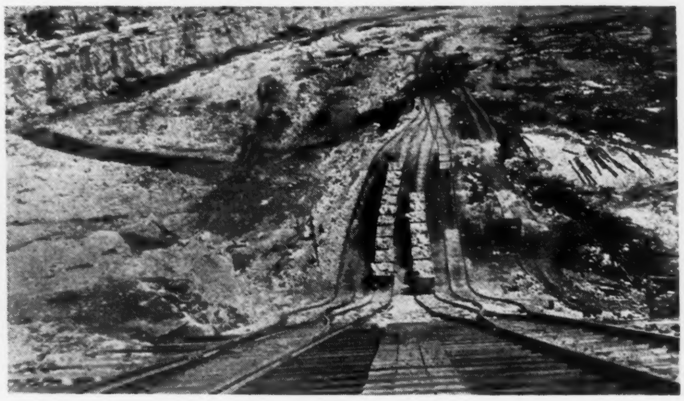

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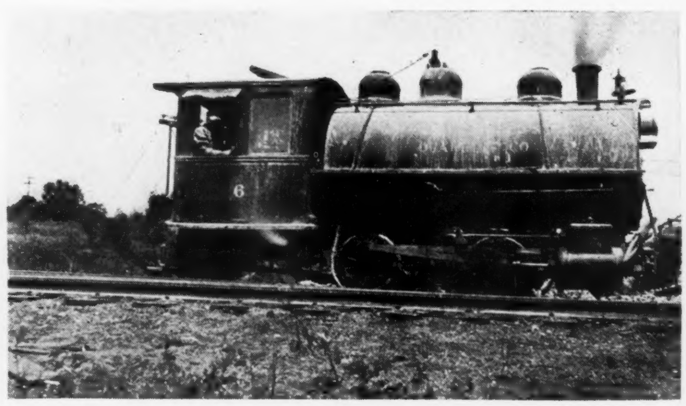

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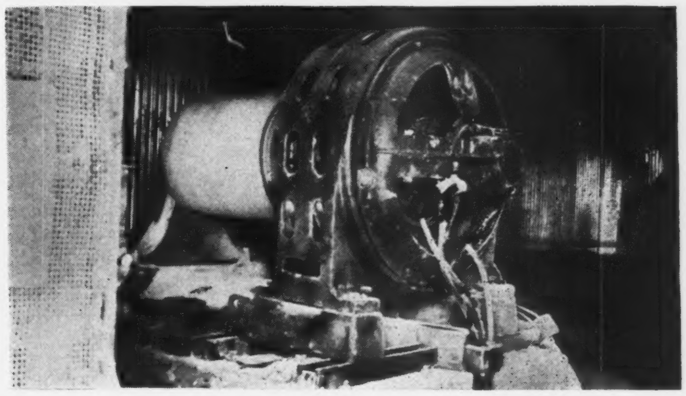

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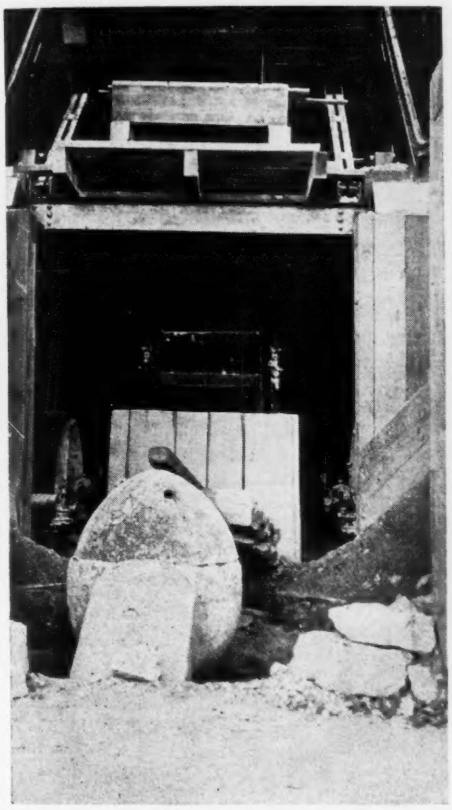

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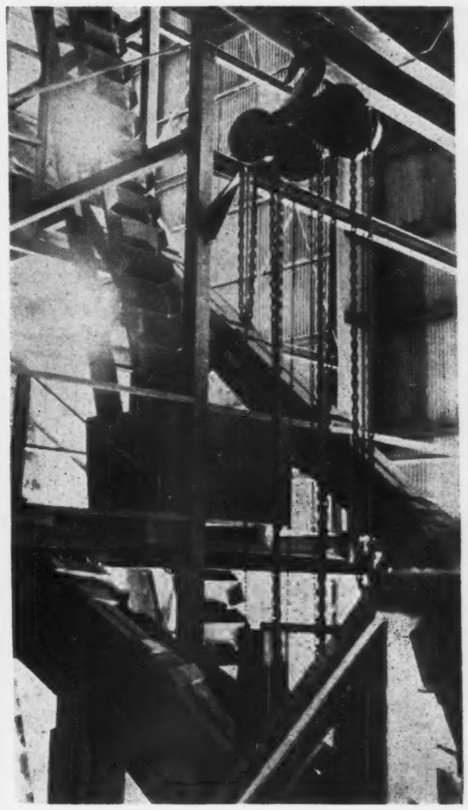
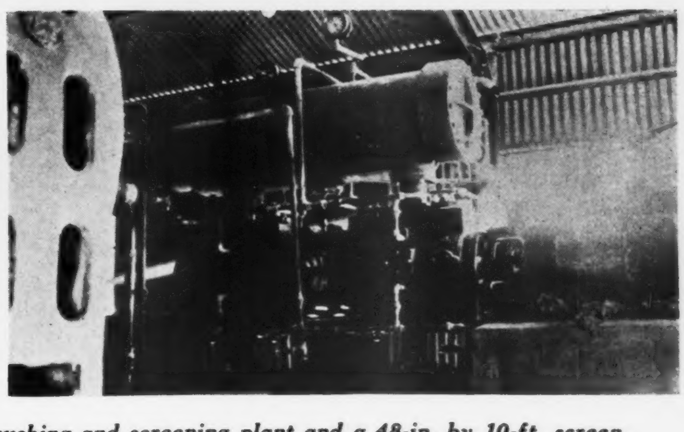
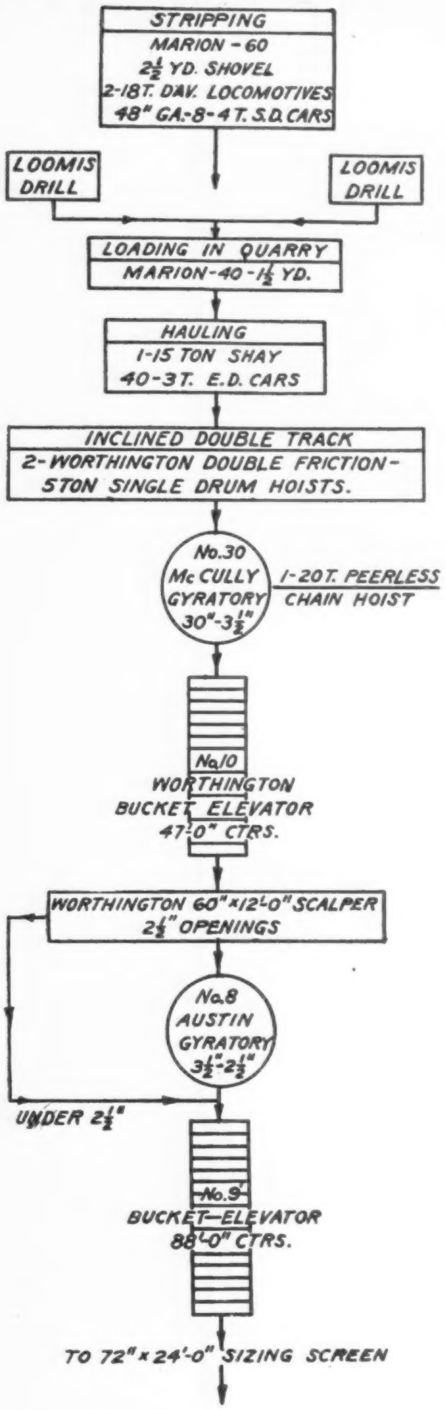


Chain hoist over crusher



Left—The 150-hp. motor which drives part of secondary crushing and screening plant and a 48-in. by 10-ft. screen. Right—Air compressor which supplies air for drills and other machines



Flow sheet of primary crushing plant

less chain hoist is suspended above the gyratory for use in case of repairs, etc.

Crushing Plant

The product of the primary crusher is conveyed on a No. 10 bucket elevator with 47-ft. centers to a 60-in. by 12-ft. scalping screen with 2½-in. openings. Oversize from this screen is fed directly into a No. 8 Austin gyratory crusher unloading on a No. 9 elevator with 88-ft. centers. The screenings from the scalping screen are also unloaded into the same elevator.

The No. 9 elevator delivers the product to the top floor of the plant and unloads into a 72-in. by 24-ft. sizing screen. Here four separations take place. The smallest opening of the screen is ½ in. All material under ½ in. passes through a pair of 48 in. by 10 ft. hexagonal screens placed side by side. The screens are of the company's own design and were manufactured by the Caldwell & Sons Co. Each has a ¼-in. screen cloth covering. The screenings from the hexagonals pass through a 60-in. by 15-ft. hexagonal with ⅛-in. openings. Screenings from this, which consist of dust up to ⅛ in., go directly into the dust bin. Oversize, which includes everything from ⅛ to ¼ in., goes into another bin. The oversize from the pair of hexagonal screens which includes stone from ¼ in. up to ½ in. passes directly into a bin.

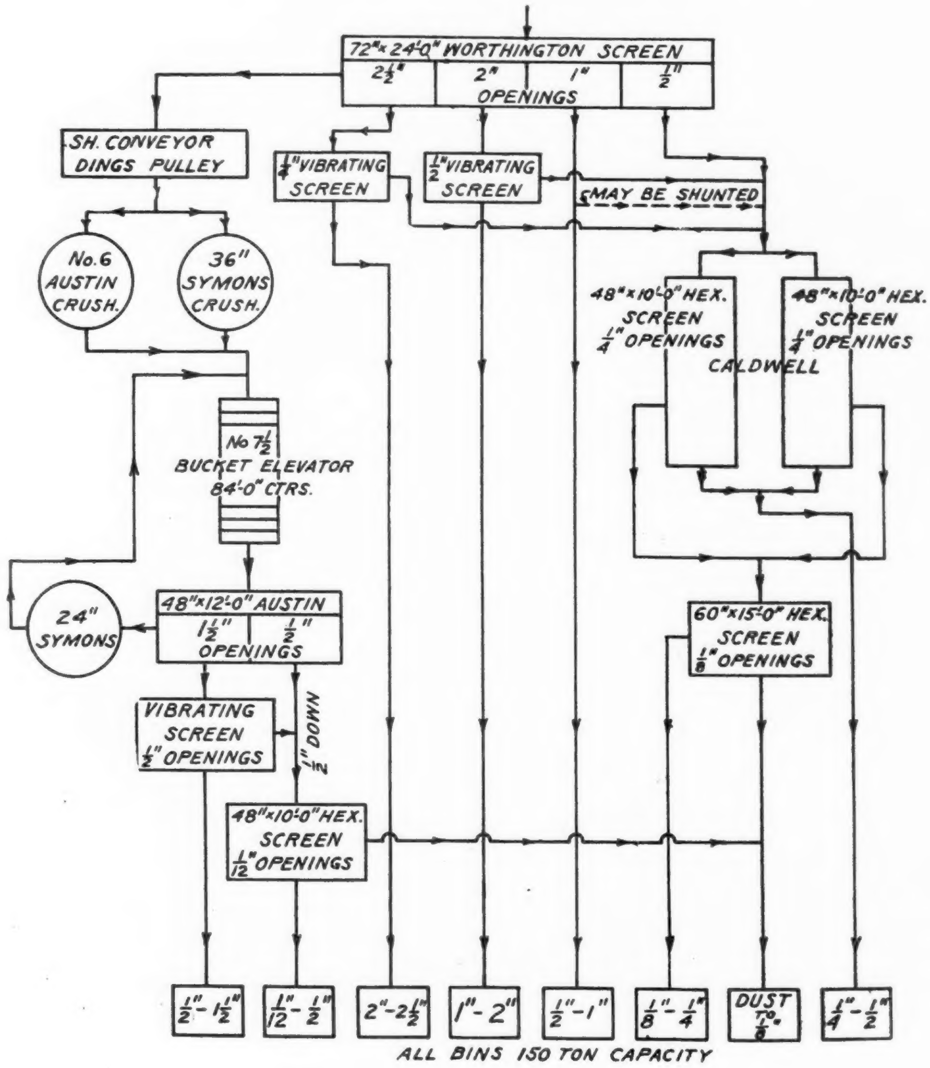
Dustless, Accurately Sized Products

The next size perforation in the sizing screen is 1 in. The stone passing through, which includes everything from ½ to 1 in., may be chuted directly into a bin, or it may be passed through the battery of hexagonal screens and be rescreened for dust.

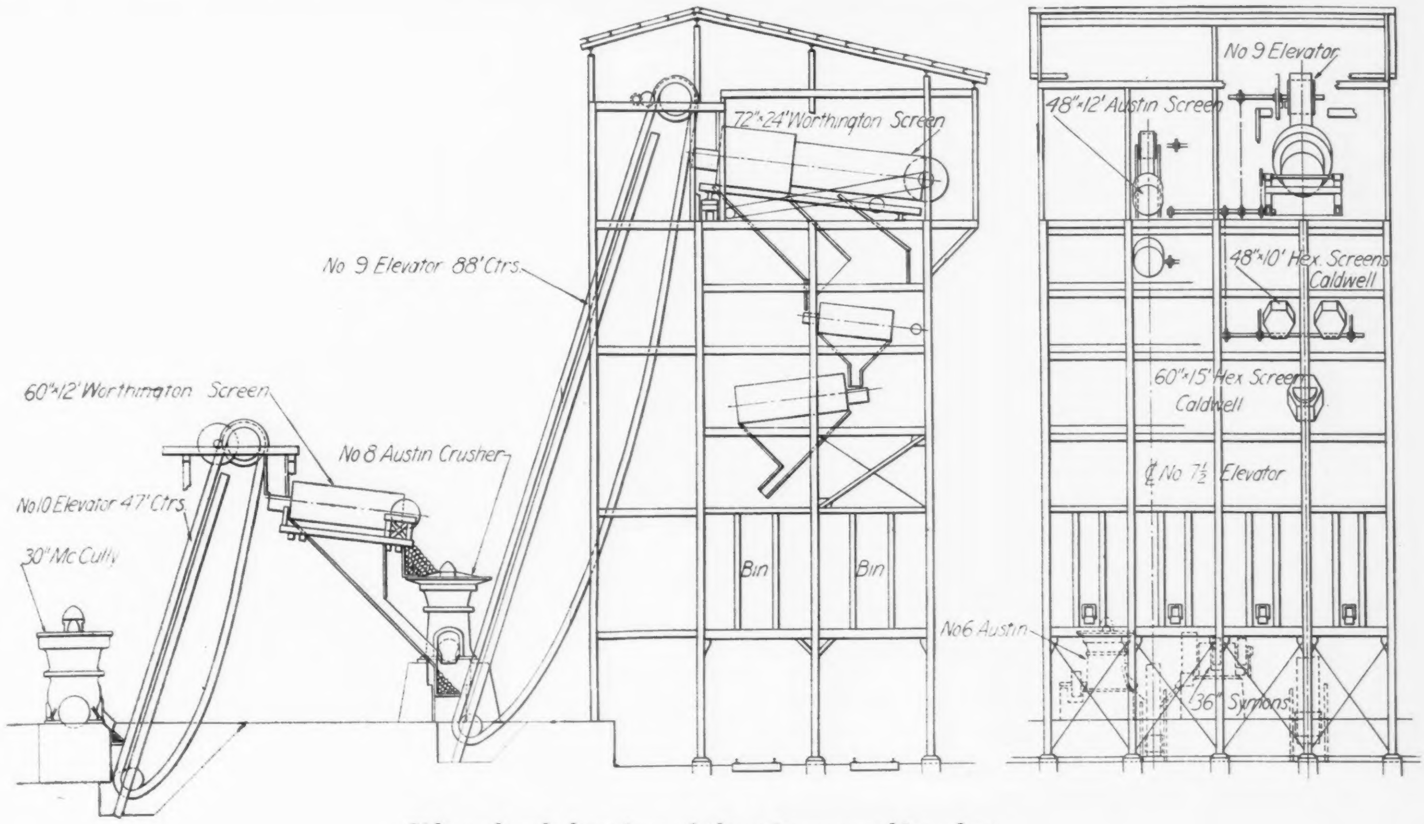
The third size separation is 2 in. Anything between 1 and 2 in. passes through this opening and over a vibrating screen with ½-in. perforations. Everything passing through this vibrating screen, which is also of the company's own design and manufacture, is shunted back to the hexagonals, and the separations as explained before take place. The screened product, which includes stone from 1 to 2 in., goes into a bin.

The fourth opening of the sizing screen is 2½ in. Here the same process used in the 2-in. section is employed. Screenings pass over a vibrating screen with ¼-in. openings and the screened product, which includes stone from 2 to 2½ in., goes directly to a bin. As in the preceding case the screenings from the vibrating screen pass through the double hexagonals.

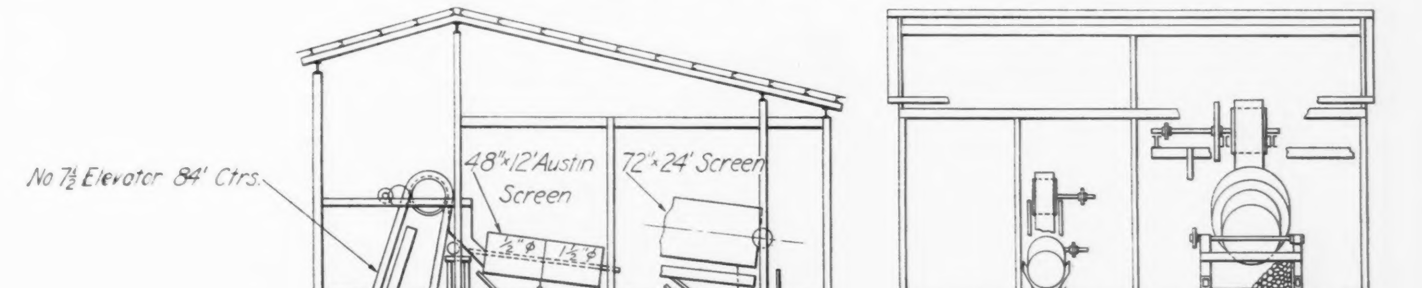
Oversize from the sizing screen, which includes stone from 2½ to 3½ in., passes on a short belt conveyor (10 ft.) and over a Dings magnetic separator pulley. Here any tramp iron is removed. This stone then passes through a No. 6 Austin and 36-in. Symons disk crusher. It may go through either or both as desired. Products of these two crushers are raised on a No. 7½ elevator with 84-ft. centers to a 48-in. by 12-ft. Austin screen equipped for two separations, namely, 1½ and ½ in. The screenings from the ½-in. section pass through a 48-in. by 10-ft. hexagonal screen with 1/12-in. openings. Material passing through the screen, which consists of dust up to 1/12-in., goes into the dust bin. Every-



Flow sheet of secondary crushing and screening plant



Side and end elevations of the primary crushing plant



Side and end elevations of the secondary crushing and screening plant

thing passing over this screen or material from 1/12 to ½ in. goes into another bin.

Stone going through the 1½-in. section in the Austin crusher screen passes over a vibrating screen with ½-in. openings. The screenings from this vibrating screen are shunted through the 48-in. by 10-ft. hexagonal screen, being finally disposed of as explained in the preceding paragraph. The oversize from this vibrator, which includes stone from ½ to 1½ in., goes into another bin.

Oversize from the Austin screen passes through a 24-in. Symons disk crusher, is recrushed, and is then unloaded at the feed end of the No. 7½ elevator. Here it is raised to the Austin screen and rescreened.

Variety of Finished Sizes

In all there are eight bins each of 150 tons capacity. These bins are of steel construction and discharge either directly into the railroad cars which run beneath them or from the side into trucks and wagons. The following sizes of material are produced and bin space is provided for each: Dust up to ⅛ in.; ⅛ to ½ in.; ⅛ to ¼ in.; ¼ to ½ in.; ½ to 1 in.; ½ to 1½ in.; 1 to 2 in.; 2 to 2½ in. (4 to 2 in. by changing screen sections). As the bins are very close together, thus any size or combination of sizes can be easily obtained. The accompanying flow sheet will give a clear idea of the crushing and screening processes.

Standard gondola cars are spotted and switched with a 20-ton Davenport steam locomotive. All cars are weighed over a Fairbanks, registering type, beam, 100-ton track scales. At the present time the company does not maintain stock piles as they are shipping material just as fast as it is produced. In fact, the plant at present is being operated 15 hours per day, and they are still considerably behind orders. Provisions for a stock pile have been made, however, as the company has a 12-ton 45-ft. Orton & Steinbrenner crane equipped with a 1-yd. bucket, and it also has ample storage space for about 100,000 tons of finished stone.

Two Motors Drive Practically Entire Plant

It will be observed that no mention has been made of the power used in the plant or method of drive employed for the various installations of equipment. Practically all the equipment in the plant is driven from line shafting through two General Electric motors, one of 500 hp. and the other of 150 hp. The 150-hp. motor is located near the Austin screen. It is connected to the line shaft through a Link-Belt silent chain, encased and running in oil, and supplies power for the following units: No. 7½ and No. 9 bucket elevators; 72-in. by 24-ft. sizing screen; 48-in. by 12-ft. screen; three vibrating screens; three 48-in. by 10-ft. hexagonal screens; one 60-in. by 15-ft. hexagonal screen. The various units are driven through a system of belting, pulleys and countershafts, all of the screens being driven through sprockets and Link-Belt chains.

The rest of the equipment in the plant is driven by a 500-hp. motor placed in the lean-to adjacent to the plant proper. It is connected to the main line shaft by a 42-in. U. S. Rubber Co. belt, 8-ply with 30-ft. centers. Other equipment in the power plant includes a Bury air compressor direct-connected to a 75-hp. G. E. motor, and a pair of Fairbanks-Morse 3¾x4-in. reciprocating pumps direct-connected to two 5-hp. Fairbanks-Morse motors. One of these pumps is used for pumping the water from a small lagoon located about a half a mile away from the plant and the other supplies the water to several water tanks located in various parts of the quarry.

Quarry Lighting Provided For

The power is purchased from the Central Indiana Power Co. coming in at 33,000 volts. It is stepped down on the three 200-k.w. transformers located on the steel rack just outside of the plant as shown, and is delivered to the motors and other electric equipment at 2300 volts. Current is 3-phase, 60-cycle. The quarry is wired for electric lighting as the demand for material has made night operation of the plant profitable.

A study of the plant layout and accompanying view will show that this is a very efficient plant. All of the equipment is new with the exception of the secondary crushing apparatus.

In addition to this plant, the Mid-West Crushed Stone Co. own and operate quarries at Ridgeville, Ind., and Spencer, Ind. The company's officers are C. C. Cartwright, president; L. R. Cartwright, vice-president; Chas. F. Meyer, Jr., secretary; Earl R. Cartwright, treasurer. E. B. Taylor is manager of the Greencastle plant and it was designed and constructed under his supervision.

Seattle Plant That Makes Many Mineral Products

THE General Basic Products Co., 4796 East Marginal way, Seattle, is an industrial plant which draws from the earth the bulk of its raw materials. From a small beginning its business today has exceeded the expectations of its founder, who, when he started, was forced to build from the ground up, as there was nothing of its kind in the Northwest, and he had ideas which he wanted to incorporate into the new business.

The company manufactures whiting, commercial whiting, putty whiting, white primers, inerts, calcimine, cold water paints, wall size, dry putty, plaster board putty, dry colors, casein, Terra Alba, waterproof glues, Caenstone cement, colored plaster finish, color stuccos, colored mortar, concrete hardener, dental plaster, high temperature cements, etc. It supplies paint companies, powder factories and other manufacturing companies with basic raw materials, as well as handling certain of its own products.

There are virtually three divisions to the business, the commercial grinding, drying and screening of raw materials for other firms, or custom trade, the manufacturing of its own products and the importation and sale of products, colors, pigments and such chemicals for the trade. In the development of his business, Mr. Smith has opened a new field for the architects of the Northwest who call upon the factory for the special materials to be used in interior decorations, for special tints for wall coverings and for colored mortar or concrete. This work is all done at the factory.

The basic business, however, is to be found in the use of carefully selected chalks from Europe. This chalk is shipped to Seattle in large lots, virtually every steamship bringing several hundred tons to the Seattle plant. The chalk is stored in the yard of the plant and drawn upon as needed. It is first fed through a grinder and pulverized. Thence it goes to a dryer and from this dryer the movement is automatic.

The dried chalk is dumped into a combination grinder and air separator, where the chalk dust is separated by the air flotation method.

This air-floated dust is drawn by a centrifugal fan to the top of the building and is handled by gravity through the entire process of mixing with colors, regrinding and remixing until it reaches the ground floor ready for being drawn from the bins for packing for the market.

Air currents carry and handle the chalk and colors, which are also ground and reground and pulverized until they can be air floated. These fine particulars are then thoroughly mixed with the various ingredients used in manufacturing the calcimine and other products of the company.

Corwin D. Smith is the president of the company; H. B. Thomson, vice-president; B. G. Campbell, secretary; H. B. Stapleton, treasurer, and John T. Roberts, chemical engineer and superintendent.—*Seattle (Wash.) Times.*

Why One Road District Sold Its Rock Crusher

NIM UNDERWOOD and several other men from Fair Play were here last Friday and moved the rock crusher which had been sold to Lahar Bros., who have the contract for gravel on the state highway in Bear Creek district. The crusher originally was bought by the Stockton Special Road District and worked all right but it was soon learned that the expense of crushing rock was greater than hauling branch or river gravel to the road, so it was abandoned.

The crusher is located at the gravel mound at the Crabtree branch and will be used to crush the larger rocks to the size wanted.—*Stockton (Mo.) Republican.*

Loading Well Drill Holes in Quarry Blasting

How to Compute Drill-Hole Spacing, Size and Charge

By J. B. Stoneking, M. E.

Technical Representative, E. I. du Pont de Nemours & Co., Wilmington, Del.

AN EXPLOSIVE may be thought of simply as a tremendous force held in leash, and blasting becomes then fundamentally the art of handling and directing this force to achieve some predetermined end. Quite often, the directing of this force is done in too careless a manner to secure the most efficient results, with the consequence that some of the energy is wasted and the cost of securing the effect desired becomes greater than necessary. An apt illustration of this phenomenon can be obtained by watching a man trying to move a heavy object by using a pinch bar as a lever. His exertions are ineffectual until he finds the one point where the application of a lever will have the greatest effect. Likewise in applying the energy of explosives to moving a quarry face—to secure the maximum breakage, the explosive must be placed where it will have the greatest effect.

The Resistances to Be Overcome

When an explosive is loaded in drill holes in homogeneous rock with a vertical face, three resistances tend to counteract the force of the explosive and prevent the block of rock from being broken and moved out onto the quarry floor. (See Fig. 1.) These are: First, the resistance distributed along the length of the hole which is represented by the tensile strength of the rock and which may be resolved into a single force acting at a point midway between the top and the bottom of the face, and of a magnitude equal to the sum of the distributed resistance; second, the shearing resistance across the horizontal line between the hole and the bottom of the face, which is represented by the shearing strength of the rock; third, the frictional resistance at the bottom to sliding.

An average of the results of a number of tests on different limestones gives 571 lb. per sq. in. or roughly 82,200 lb. per sq. ft. as the tensile strength. Averaging the shearing strengths in the same manner gives 184,000 lb. per sq. ft. The average of a number of granites gives 101,500 lb. per sq. ft., as the tensile strength and 287,000 lb. per sq. ft. as the shearing strength. The average weight of the limestones tested was 165 lb. per cu. ft. and of the granites 168 lb. or approximately 12 cu. ft. per ton. Actual values for trap rock as to shearing and tensile resistance are not available but they may be assumed for practical blasting purposes as being approximately the same as for granite. Trap rock is, however, considerably heavier, averaging about 180 lbs. per cu. ft. or 11 cu. ft. per ton in place.

If d represents the depth of the hole in feet and b the distance back from the face, then in limestone for each foot of width or spacing between holes

82,200 d=the tensile resistance which may be considered as concentrated at the midpoint of the depth.

187,000 b=the shearing resistance concentrated at the bottom.

$165 \times b \times d$=the weight of the block and assuming a coefficient of friction of 0.65, which is probably somewhat low,

165 $bd \times 0.65 = 107$ bd=the frictional resistance at the bottom.

For granite the similar values are:

101,500 d=tensile resistance

287,000 b=shearing resistance

109 bd=frictional resistance to sliding.

The above values for the shearing resistance, of course, apply only to homogeneous material and would not hold good for quarries having a parting line at the floor.

Computing the Depth of the Charge

The ideal way to overcome these resistances would be to concentrate sufficient explosive force in a chamber at the bottom of the hole to overcome the shearing and frictional resistances and to distribute enough explosives all of the way up the hole to counteract the tensile resistance. In practice, however, this is not feasible in all cases; hence the explosive must be distributed vertically in the hole and the sum of its distributed force may be considered as being concentrated at a given point, half of the force being above this point and half below. In order for the force to be most effectively applied, this point of concentration should be at such a place as to balance the opposing resistances of the rock. As shown in Fig. 1, this point will be between the points where the resistances of the rock are concentrated and at a distance above the bottom, shown as y, proportional to the magnitude of those resistances.

This distance can be found from the following formula:

$$y = \frac{d}{2} \times \frac{\text{Tensile resistance}}{\text{Tensile resistance} + (\text{shearing resistance} + \text{frictional resistance})}$$

Substituting the various resistance values for limestone given above

$$y = \frac{d}{2} \times \frac{82{,}200\, d}{82{,}200\, d + (184{,}000\, b + 107\, bd)}$$

For granite,

$$y = \frac{d}{2} \times \frac{101{,}500\, d}{101{,}500\, d + (287{,}000\, b + 109\, bd)}$$

Thus y gives the point above the bottom which for practical purposes can be taken as the dividing point in the explosive charge, one-half of the necessary weight of explosive to be loaded below this point and one-half above.

Computing the Amount of Explosives Required

To determine what weight of explosive will be needed it is necessary to know not only the depth of the hole and the distance back from the face, but also the spacing between holes. From these three factors the burden in cubic feet and in tons on each hole can be calculated. Drill holes cost money and hence should be judiciously placed so as to allow loading the explosive where it will do the most effective work and thus yield the largest return on both the cost of the explosive and the cost of drilling. With some drillers the attitude seems to be "Oh, put the holes where easiest and most convenient and let the explosive do the work."

This is poor policy as it is well known in

The height of bottom load shown in above table is an average between limestone and granite.

Assuming an average duty of explosives of 4 tons of rock to be broken out per pound

TABLE I—SPACING HOLES IN QUARRY WITH FREE VERTICAL FACE

Depth of hole (feet)	Height of face (feet)	Distance back (feet)	Spacing apart (feet)	Height of bottom load (feet)	Dia. of hole at bottom (inches)	Depth of top tamping (feet)
20	18	13	10½	3½	4	9
30	28	14½	12	6½	4¼	10
40	37	16	13	10	4½	12
50	47	17½	14	13	4¾	13
60	56	19	15½	16	5	14
70	66	20½	16½	20	5¼	15
80	75	22	18	23	5½	16
90	85	23½	19	27	5¾	17
100	94	25	20	30	6	18

practice that the greater the distance away from the explosive charge the poorer the fragmentation. Rocks vary greatly in their degree of fragmentation under shock, hence the spacing of holes and distance back from the face to give the best fragmentation consistent with costs must be worked out for each quarry by actual trial. Where there is no parting line at the quarry floor, the holes must be extended below the floor line to insure pulling bottom. Table I shows average recommendations for the placing of holes in a quarry with a free vertical face.

of explosive, and the spacing of holes as

$$y = \frac{82{,}200\ d}{82{,}200\ d + 184{,}000\ b + 107\ bd} \times \frac{d}{2}$$

$$= \frac{82{,}200 \times 100}{(82{,}200 \times 100) + (184{,}000 \times 25) + (107 \times 25 \times 100)} \times \frac{100}{2} = 31.4 \text{ ft.}$$

given in Table I, a 100-ft. hole in limestone would carry a burden of about 4160 tons

$$\left\{ \frac{100 \text{ ft.} \times 25 \text{ ft.} \times 20 \text{ ft.}}{12 \text{ cubic feet per ton}} = 4166 \text{ tons} \right\}$$

and would require a charge of 1040 lb. (See Fig. 2.) Applying the formula as given above,

Selecting the Charge

Thus one-half the explosive charge, or 520 lb., should be loaded in the bottom 31 ft. of hole. Now two things regulate the weight of explosive that can be loaded in any given depth of hole; the diameter of the hole and the density of the explosive. A light bulky powder may fill up the hole too fast to allow the proper concentration in the bottom, while a heavy, dense explosive may give too much concentration to permit the proper distribution of force without heavily overloading the hole.

TABLE II—LOAD CHARGES IN VARIOUS STRENGTHS OF POWDER

Dia. of hole (inches)	Pounds per foot of hole: Red Cross extra	Quarry gelatin	Durox	Dumorite	Monobel
4	6.25	7.25	4.00	4.75	5.00
4½	8.00	9.25	5.25	6.00	6.25
5	10.00	11.75	6.75	7.75	8.00
5½	12.00	14.00	8.00	9.00	9.50
5⅝	12.50	15.00	8.50	9.50	10.00
6	14.50	16.75	9.50	10.75	11.25
6½	16.75	19.50	11.25	12.75	13.25
7	19.50	22.75	13.25	15.00	15.50

How Much Explosive Can Be Loaded Per Foot of Blast Hole?

The following table shows the approximate weight of explosive of various kinds that may be loaded per foot of hole of various diameters provided the water has been bailed out and the cartridges are slit and well tamped so that the explosive spreads out, completely filling the hole and leaving no air space.

Consulting this table, it is found that "Quarry Gelatin" in a 6-in. diameter hole would allow loading 520 lb. in the bottom 31 ft. The next question is the top load. In some quarries there is objection to loading any explosive in the upper part of the hole, but the fragmentation is better in homogeneous material if the explosive charge is carried up to such a point as to allow only for sufficient tamping on top of the charge. Of course, when the top layers of rock are badly cracked and seamed it is better not

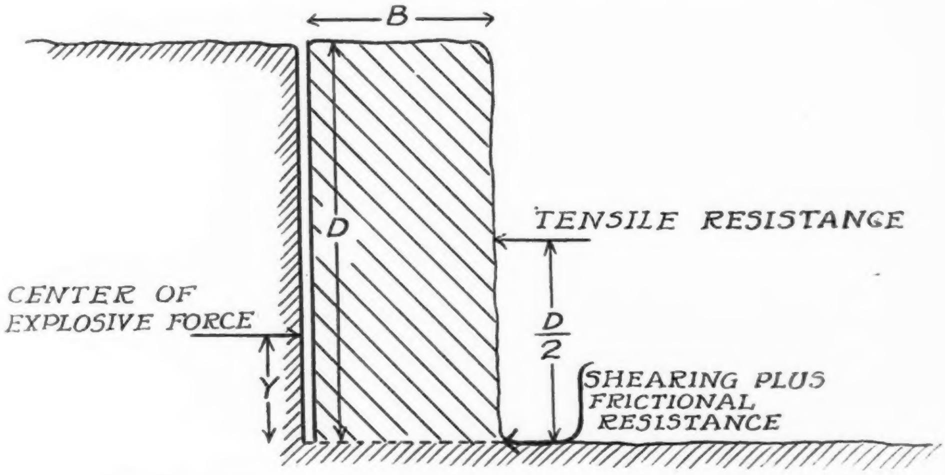


Diagram illustrating the application of formula on preceding page

Diagram illustrating application of formula above for depth and spacing of charge

to load any explosive in them. Referring again to Table I, it is seen that for a 6-in. hole of the depth and spacing of our problem in Fig. 2, a tamping of 18 ft. is recommended. This leaves 51 ft. between the bottom load and the tamping for the second half of the charge, or 520 lb.; 520 lb. of "Red Cross Extra" would fill up 36 ft. of hole, leaving 15 ft. of the 51 ft. to be filled up with stemming material.

Advantages of Splitting the Charge

In order to secure as much distribution as possible it would be better to practice broken loading, splitting the charge into four sections with 5 ft. of stemming between the sections. If electric blasting caps are used, it would not be wise to split the charge into so many sections on account of the difficulty attending the successful handling of so many wires in the hole. With cordeau as a detonating agent, however, there would be no difficulty in breaking the charge as often as desired. In work where faces have both hard and soft ledges above the bottom load, the breaks in the charge are made so that the explosive will be loaded in the hard strata and the stemming in the weaker strata. In more uniform material, the practice is to place the broken charges in adjoining holes in such relative position that explosive and stemming will alternate along the line of holes, i.e. to stagger the loading.

The height of the bottom load or charge may be worked out in the manner explained above for various depths and spacing of holes as shown in Table I, and the diameter of hole required to accommodate this weight of explosive in the bottom determined. In cases where the face is somewhat sloping, causing a heavy toe, the total shearing resistance is increased and it therefore becomes necessary to place a greater ratio of explosive in the bottom than when the face is vertical. This can be accomplished by drilling larger diameter holes or by decreasing the spacing between holes. Heavy toes are avoided in practice where possible. A row of snake holes at the bottom is sometimes used to assist the well drill holes in a heavy toe. Where there is a well defined parting line at the quarry floor, it is usually not necessary to drill below grade. Moreover as the shearing resistance is considerably reduced, the weight of explosives required in the bottom is not so great, hence better distribution of the charge is possible.

The Best Size of Well-Drill Hole

It is the general impression among drill men that, all other things being equal, the drilling speed depends upon the area of the hole. According to this theory a 4½-in. hole with an area of 15.9 sq. in. could be drilled much faster than a 6-in. hole with an area of 33.2 sq. in., and as the labor item in well drilling is generally around 75% of the total drilling cost, speed or footage is an important factor. Practically, the larger diameter of hole permits the use of heavier drilling tools and the heavier blow struck by these offsets to a considerable extent the difference in area of the holes. The fact remains, however, that a hole larger than is required to hold the necessary amount of explosive in the bottom is in the nature of an added expense.

The explosive to use depends upon the hardness, elasticity and toughness of the rock as well as upon the already existing fracture planes and slips. The degree of fragmentation desired and the relative costs incurred with different explosives in getting this fragmentation are also important factors. In short, the choice of explosive is an individual problem for each quarry and recommendations can be made only in general terms.

For soft limestone and rocks of similar breaking characteristics, "Red Cross Extra" in 30% to 40% strengths, "Monobel No. 1," "Durox" and "Dumorite" are much used. For wet holes, or where greater concentration of charge is necessary, "Quarry Gelatin" in 25% and 30% strengths is well adapted.

In medium limestone, "Quarry Gelatin" in 40% to 50% strengths for the bottom load with "Red Cross Extra" 40% or "Dumorite" for the top gives good results.

Hard limestone gives better fragmentation when 50% to 60% "Quarry Gelatin" is used on the bottom in combination with "Red Cross Extra" 40% to 50% for the top.

Very hard rocks such as granites and traps require 60% to 75% "Quarry Gelatin" for the bottoms with "Red Cross Extra" 60% for the tops, and in extreme cases a 75% "Quarry Gelatin" in the bottom with 60% "Quarry Gelatin" for the top gives the best results.

Baltimore & Ohio Lime Special

THE West Virginia lime train, on the Baltimore & Ohio railroad, was at Cox's Landing, Cabell county, on August 25 for the entire day.

This is the only point in the county at which the train touched. Farmers had been asked to gather samples of their soil and bring it to the train where experts tested the sample and advised as to the kind of fertilizer that should be used.

Nat T. Frame, director of the West Virginia extension service; H. G. Knight, director of the experiment station, Prof. D. R. Dodd and Dr. E. P. Deitrich and Prof. K. S. Quisenberry, all of the West Virginia University, gave instructions on lime and soil fertility at the train.

The train also stopped at Cox's Landing through the co-operation of the Cabell County Farm Bureau with the extension service and experiment station, the lime and limestone manufacturers and the Baltimore & Ohio railroad.

"Most of the soil in Cabell county needs lime," F. N. Darling, county agricultural agent, said recently. "Tests of representative samples of the soil show that. With lime applied to the soil it will become twice as productive."

The Farm Bureau invited all the farmers in the county to visit the lime train, and spend the entire day consulting with the experts.

Both hydrated lime and ground limestone were available. Farmers were asked to bring their wagons and enough lime to cover their soil was given them by the state. —*Huntington (W. Va.) Herald-Dispatch.*

To Make Research of Concrete Road Reinforcement

ANNOUNCEMENT is made by Chas. M. Upham, Director of the Advisory Board of Highway Research of the National Research Council, that C. A. Hogentogler of the U. S. Bureau of Public Roads has been granted leave of absence in order to conduct for that board a fact-finding survey of the economic value of reinforcement in concrete pavements. This survey is to be national in scope, and will be conducted in co-operation with agencies interested in this important subject. It is proposed to cover the various soils, traffic and climatic conditions throughout the United States.

Mr. Hogentogler has had 15 years of experience in highway construction and highway research which well qualifies him to take charge of the present investigation. After graduation from the Pennsylvania State College, and a short period with the Pennsylvania Steel Co., he was with the Pennsylvania State Highway Department, followed by several years on street and road construction with the borough of Columbia, Penn. For two years he was assistant professor of civil engineering at the University of Idaho. He was then engaged in research with the U. S. Bureau of Standards and finally with the U. S. Bureau of Public Roads, in which organization he has been for the past six years.

During this period Mr. Hogentogler has been actively engaged in a number of important highway researches. These include the first impact and wear tests at Arlington Farms and the tests to determine the cushioning properties of tires now being conducted by the U. S. Bureau of Public Roads in co-operation with the Rubber Association of America and the Society of Automotive Engineers. In 1923 Mr. Hogentogler, as representative of the Bureau of Public Roads, conducted the study made in co-operation with the advisory board on highway research which resulted in the publication by the National Research Council of its Bulletin No. 35, entitled "Apparatus Used in Highway Research Projects in the U. S."

Mr. Hogentogler is the author of a number of important research papers which have appeared in *Public Roads* and were reprinted in various technical periodicals. He is a member of the American Concrete Institute and an associate member of the American Society of Civil Engineers.

A Simple Washing Plant for Sand and Gravel

This Georgia Producer Reduced Sand and Gravel Production to the Lowest Terms by Making Only Two Products with a Gravity Screen

By George M. Earnshaw
Central Representative, ROCK PRODUCTS

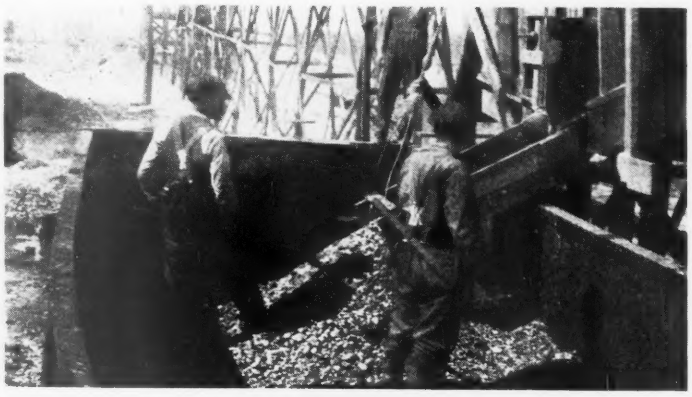
THE big, modern sand and gravel plant, with screening and storage systems and bins for the various sized products, looms so large in the minds of those of us who are connected with the industry that we are in danger of forgetting the small and simple plant that is possible where only two or three products are to be made. But such plants have their place, and it is an important place. Sometimes a plant like this may be a useful auxiliary to a big plant. One Illinois producer uses a small plant (which is almost a duplicate of the one described here) for producing railroad ballast and sand because it can be more cheaply operated than the regular washing plant.

THE washing and screening plant of the Chehaw Sand and Gravel Co. is located in the district norteast of Montgomery, Ala., in which so many important Southern producing companies are working. It is situated in the village of Chehaw on the line of the Atlanta and West Point railroad.

There are 650 acres of land in the company's property, all of which are of high grade commercial sand and gravel. The gravel from the pits of this company is, in fact, of an unusually high grade, as it tests as high as trap rock in the regular wearing tests used for highway material.

The sand in this deposit is very clean, so clean that it hradly needs washing at all. The process might be more aptly described as "wet screening," although there is a considerable overflow from the railroad car which receives the sand, sufficient to carry away the small amount of dirt which the sand contains.

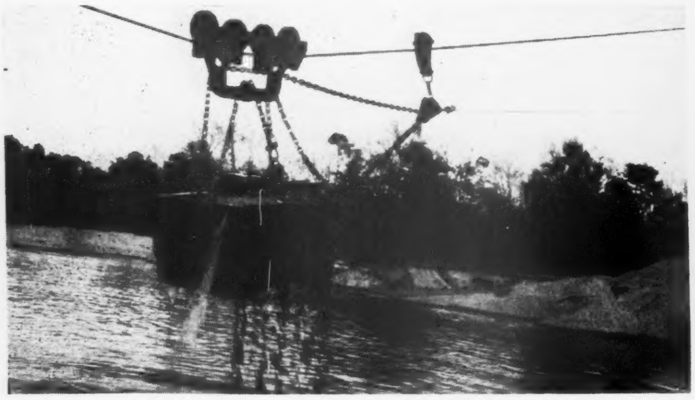
The bank material is dug with a Sauermann cableway dragline outfit. And the installation of this equipment like the rest of the plant has been reduced to the simplest terms. The mast is a big pole, 78 ft. high, and guyed in the usual manner. There is no receiving hopper. The bucket dumps on an inclined platform 20 ft. square. This has an inclination of one foot in five, which is enough, in connection with the water and the jar given as the load strikes the platform, to run the heaviest gravel to the sluice below. The bucket is of the regular Sauermann type of 2-y. capacity; the track cable is 1¾ in. in diameter and a ⅞-in. cable is used for both the load and trip lines. A 10x13-in. Mundy hoist runs the bucket and this receives its steam from a 125-hp. Ames locomotive fire-box boiler. A steam pressure of 125 lb. is carried.



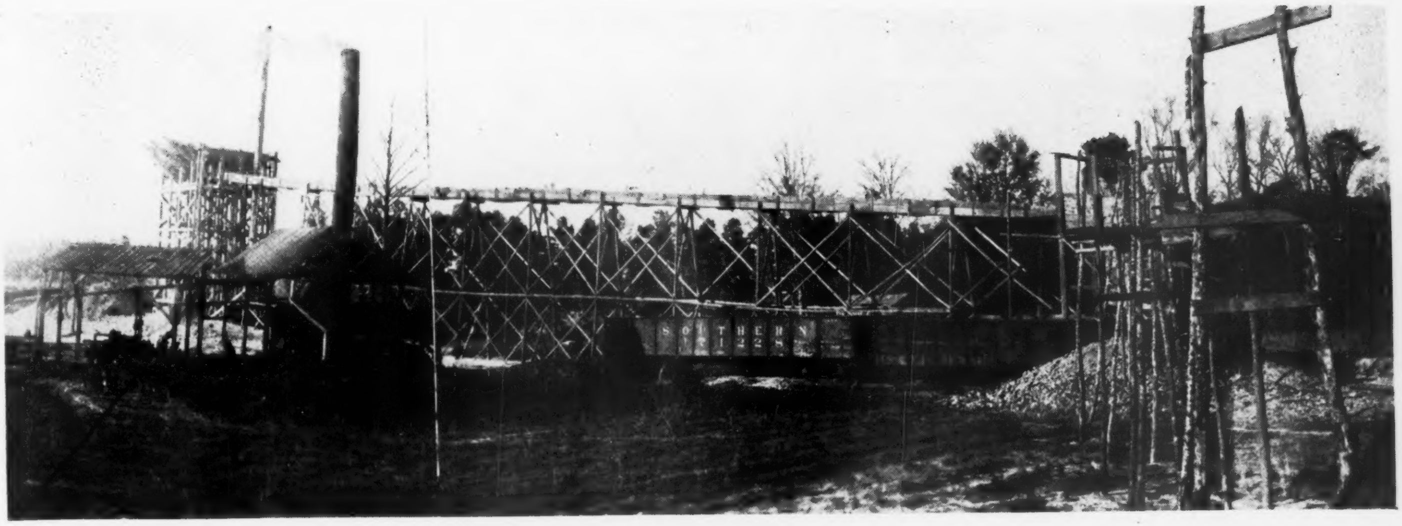
The sluice which connects the receiving tower with the screening tower is 185 ft. long. It is 20 in. deep and 36 in. wide. Besides connecting the two towers, this long sluiceway has the advantage of being a very good scrubber.

This sluice, as shown in the illustration, is supported on a light but strong wooden trestle. In some parts poles of native timber have been used in the construction. Wherever these poles can be cut on or near the ground on which a plant is to be erected they form a cheap and substantial material.

The sluice discharges on a small bar grizzly and then on a section of woven wire screen, 8x11 ft., with 3/16 in. square openings which is set at an angle of 40 deg. Experience in this and in other plants has shown that this is the angle for woven wire screens at which ordinary sand and gravel is sure to run, even though it may contain a considerable number of flattish pieces. The screen frame is arranged so that another size of mesh may be quickly inserted if this is desired.



Center (above)—Gravel, the oversize of the gravity screen running into cars. Left—Dragline bucket just leaving the water. Right—Dragline hoist and hoistmen



Plant of the Chehaw Sand and Gravel Co. showing the receiving hopper and mast at the left and the flume to the screening plant at the right

Only two sizes are made, sand, which is everything that passes the 3/16 in. square mesh screen, and gravel, everything that goes over it. The two products are run directly to cars and there is no bin or other form of storage.

A little additional height at this point would give room for the addition of a second gravity screen following the first. This would give some control over the grading of the gravel by taking out more or less of the small sizes, next in size to sand, as required.

The car that is being filled serves as a sand settler. Of course there is a considerable overflow from this car and this is enough to carry away the little dirt the sand contains. The lack of a sand settler is, however, to be criticised, because running sand directly into a car with so much water is bound to cause segregation of fine and coarse grains, and the overflow cannot be depended upon to give a thorough washing. And the use of much water would be bound to overflow some sand that should remain in the car.

Where this arrangement is used, the sand from below the screen being run directly to the car, it is sometimes advisable to take out a part of the finer grains of sand. This can be done by a second screen under the first, giving an inefficient screening, but reducing the water content of the sand going to the car and getting rid of a lot of clay with the fines. This system is used at one plant of which the writer knows in connection with a shield of boards which covers the second screen. If the sand is running to coarse the shield is slid along to cover more of the screen; if it is running too fine it is run back to cover less of the screen and thus take out more of the fines. Enough water goes over the screen with the coarse to carry it through the chute to the cars. The fine sand is run to waste, although wherever there was a market for fine sand it would be a simple matter to save it.

The water supply for the plant is fur-

The screening tower has a small grizzly in the box at the right and a simple gravity screen for separating sand and gravel

The 6-in. pump that furnishes water for washing is run by a gasoline truck motor

nished by a Worthington size 6-CL-C centrifugal pump, and this installation is interesting because of the method of driving the pump. The runner shaft is directly connected to a 40-hp. motor taken from a Springfield-Kelley truck. Gasoline is used as fuel.

The pump has an 8-in. suction and a 6-in. discharge line which runs to the top of the receiving tower where it is split into a 5-in. and a 3-in. line. The 5-in. line runs to the sluice and the 3-in. line to the entrance.

An auxiliary steam pump is sometimes used, a 7x10x12-in. Knowles with a 6-in. suction and 5-in. discharge, which takes its steam from the hoisting-engine boiler.

This little plant has a capacity of 18 cars per day. Nine men compose the whole working force, including a master mechanic and superintendent.

The office of the company is at 39 South Forsythe street, Atlanta. J. S. Waterman is president and G. M. and H. D. Greenfield is secretary and treasurer.

The installation of a plant of this kind is justified in certain localities where it is not required to produce sand and gravel to meet the close specifications of highway work and for certain temporary work. In some states on the western side of the Mississippi plants resembling this produce a large proportion of the sand and gravel used in that section.

Operating force of the Chehaw Sand and Gravel Co.

Government Studies Oil Shales

RESULTS of assay retort studies of ten typical oil shales, made by co-operative investigators of the Department of the Interior and the state of Colorado, are given in Serial 2603, recently issued by the Bureau of Mines. In this report the yields and the results of analyses of the oil and gas produced from a number of oil-shale samples from the principal deposits of Colorado and other oil-shale states, are compared with samples from Scotland and Australia, where the oil-shale industry has had its greatest commercial development, and also with a sample from Brazil where extensive oil shale deposits are found.

The investigators found that the Colorado shales, all of which are from the Green river formation, have more resemblance to each other than to the shales from the other regions, yet, there is enough variation in the nature of the products to distinguish each shale from the others. Australian and Scottish shale oils showed the highest saturation of any of the oils tested. This seems to indicate the superiority of the oils produced from the foreign shales. The oils from the Scottish, Nevada and Australian shales were similar to the crude petroleums of the so-called "paraffin base"; the Kentucky shale oil was rich in asphalt, and the Colorado and Utah shale oils tested were intermediate.

The tendency of some of the shales to fuse when heated is a problem that will warrant further study. This coking or fusing property apparently does not bear any direct relationship to the oil yield, and it is apparent that the richness of the shale does not indicate its tendency to coke.

Leaner parts of the a shale have a greater tendency to break into smaller pieces than the richer parts, but the size of the particles, provided the sample is thoroughly mixed, has no effect on the oil yield. In preparing a sample of shale for assay retort tests, it is necessary to grind and mix the shale so that there will be no separation of the richer and leaner parts.

Vapor-phase cracking of a shale oil as it is being produced from a retort causes a lowering of the oil yield, an increase in the specific gravity, an increase in the percentage of light distillate from the crude oil, but a decrease in the amount of distillate from a unit quantity of shale, a lowering of the settling point, and an increase in the carbon residue. Partly filling the assay retort does not affect the quantity or quality of oil produced.

All shales examined yielded more oil at the fast rate of retorting than at the slow rate. At the slower rates the quality of the oils was superior to that of the oil produced at the faster rates in so far as amount of light distillate, percentage of unsaturation, viscosity of vacuum distillation fractions, and carbon residue of the vacuum distillation residuum are concerned, although the quantity of the crude oils was less. The volume of gas produced was greater in the slow runs, but the gas yield holds no relations to the oil yield.

The American shale oils will, no doubt, present a more difficult refining problem than has been encountered in those countries where oil-shale has reached its greatest commercial development.

A further study is being made of the chemical composition of the shale, distribution of nitrogen and sulphur in the products and the temperatures at which organic matter decomposes, and the results will be presented in subsequent papers. With complete data available on the chemical composition of the shales, it may be possible to explain some of the differences in the nature of the products from the various shales.

Copies of Serial 2503, by W. L. Finley, J. W. Horne, D. W. Gould, and A. D. Bauer, may be obtained from the Department of the Interior, Bureau of Mines, Washington.

Tries to Have Foreign Cement Employed on a Florida Construction

OBJECTION to a requirement in the river water plant project that cement used in construction be made in the United States, was made to the city commission by George V. Booker, president of Booker & Co., Inc., building material firm in Tampa, Fla.

Mr. Booker said his firm has reduced the price of cement here by importing it from foreign countries and he believed the requirement in the specifications discriminatory. He said foreign cement is as good as that made in the United States and his firm should have the right to supply this if it can meet competitive prices. His company supplied the cement used in the new municipal docks and terminals, Mr. Booker said.

Mr. Booker was requested to submit his complaint in writing and it will be sent to Nicholas S. Hill, Jr., New York consulting engineer on the project, in an effort to have the matter adjusted.

Though the city could not save anything at this time by making it possible for the Booker firm to supply cement at less cost because contracts for the work already have been awarded, the commissioners said they would seek to have the specifications changed to make it possible for a home concern to supply some of the material.—*Tampa (Fla.) Tribune.*

Cutting Costs in Towing Sand and Gravel Barges

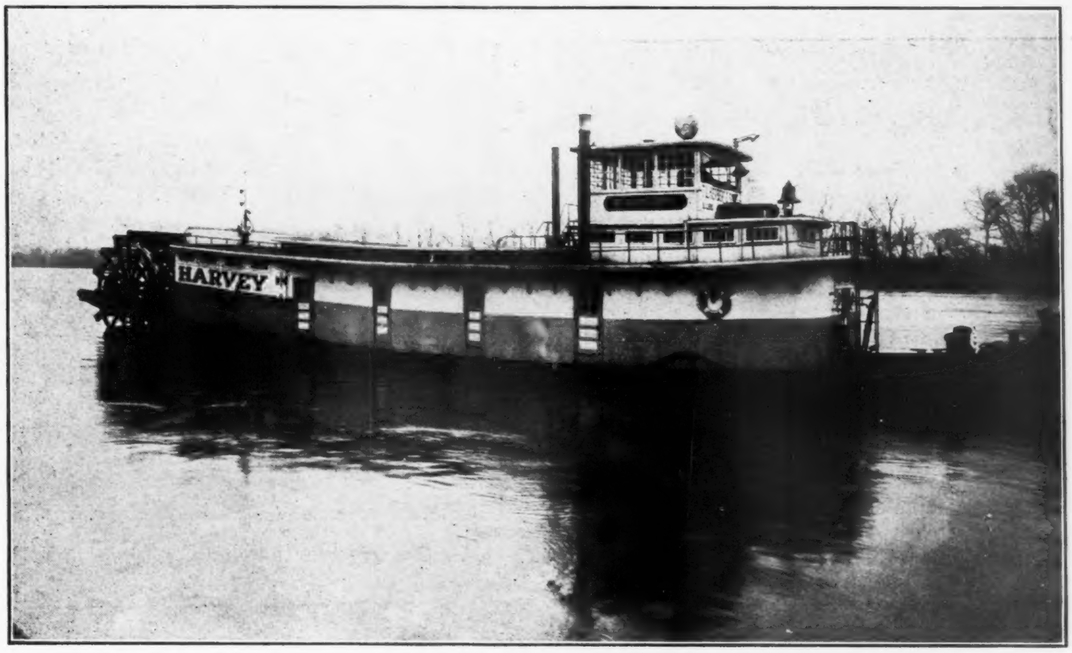
Improved Barge Design and a New Type of Tow Boat with Diesel Engines Enable T. L. Herbert & Sons to Reduce Towing Charges to a Remarkable Degree

TRANSPORTATION is one of the heaviest items in the cost sheet of plants that produce sand and gravel by dredging in rivers. As the river bars near the market become exhausted the tow lengthens, and it is not uncommon to find that sand and gravel companies are barging the product 20 miles and in some cases as much as 40 and 50 miles.

This towing costs money and in producing a low-priced material like sand and gravel every item has to be studied to keep the cost well below the sales price. So any improvement in tranportation is of importance. T. L. Herbert and Sons of Nashville, Tenn., understood this when they began their study of the subject which has resulted in a type of barge and a new type of tow boat which together have lessened the transportation charge to a remarkable degree.

One does not consider a barge as a piece of naval architecture nor expect it to have the lines of a yacht, any more than one would expect a truck to look like a limousine. The first duty of a barge is to carry its load. After that it must be built sturdy enough to withstand the rough usage of towing and lying alongside the dredge or a barge in a swift current. But the design adopted by the Herberts has all these good qualities and in addition it tows easily. Since its adoption the time required for towing, and consequently the fuel and wear and tear on the towboat and barges has been reduced about 16%, due wholly to a better design.

The gravel is dredged from the bars of the Cumberland river about 20 miles down the river from Nashville, Tenn. The "down the river" part is important, for while the empty barges go down the river without very much assistance from the tow boat they have to go back "up hill," against a current that is normally three miles an hour, but that may exceed this considerably in high water periods.



Diesel-engine powered towboat "Harvey" of T. L. Herbert & Sons, Nashville, Tenn.

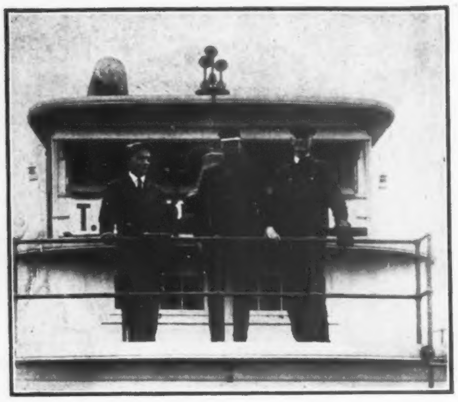
Details of Barge

A plan and side elevation of the barge accompany this. The most noticeable variations from the ordinary type (which is built of wood usually) is the long rake at both ends and the high lift at both bow and stern and the steel construction. These are the features that make it tow more easily than the old flat box type with a slight rounding rake.

The overall dimensions are 100x22 ft. and the depth is 5 ft. The cargo box is 3 ft. deep. The barge is of the flush deck type, none of the cargo being carried below the deck. The sides of the cargo box are of 2¾-in. planking held by a 3-in. angle irons and these angle irons are braced by a piece of 1½-in. pipe welded to the angle iron and to the deck. The cargo is divided into three compartments.

The frame of the barge is of a specially rolled T section shown in a sketch. Both floor beams and deck beams are of 6-in. channel iron. The sides and bottom are 5/16-in. plate and the deck is of ¼-in. plate. A false deck of 2¾-in. planking is placed in the cargo box to prevent the real deck from injury by the clamshell during the unloading.

There are three bulkheads in the boat, two at the line where the raked portion joins the main hull and a longitudinal bulkhead in the main hull, forming a center keelson. These bulkheads stiffen the construction and provide some protection against sinking from a leak. There is no



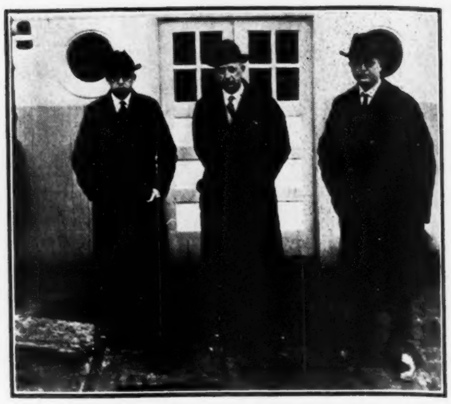
On the bridge of the "Harvey"

"head log" to resist a blow against the wharf or similar accident. Whatever bumps the barge has received so far it has been able to withstand without leaking. But as even the best steel construction leaks a little, manholes are provided for each compartment by which it may be pumped out by a bilge pump on the tow boat.

As Alex Dann pointed out in his paper on barges at the St. Louis sand and gravel convention, the size and shape of barges is not determined by a whim or preference on the part of the designer. These dimensions must be adapted to the river conditions, especially to the depth of water in which the barge must float at low water periods and the space in which it must be turned. The dimensions of the Herbert barges have been determined by these things and have resulted in a barge that will load 225 tons of sand and 275 tons of gravel. In larger and deeper rivers it would be economy to increase the dimensions especially for long tows. Some barges on the Mississippi carry 1200 tons and on some of the bays on the Atlantic coast barges of 3000 tons burden are used.

Details of Towboat "Harvey"

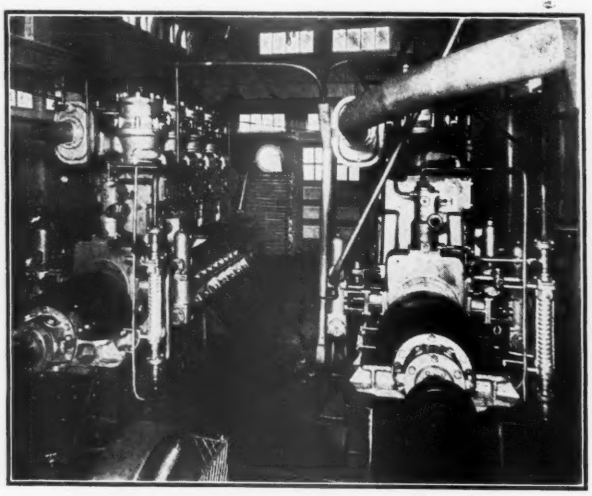
The tow boat *Harvey* is the latest addition to the Herbert fleet and it has attracted considerable attention in marine circles because it is the first "sternwheeler" to be equipped with full Diesel engines. It was designed by Harvey Herbert, who was educated as a mechanical engineer and who does all the engineering work for the firm of which he is a member. The Diesel engines were made by the Worthington Pump and Machinery Corp. and are real marvels of compactness and efficiency. Each is of 175 hp. They



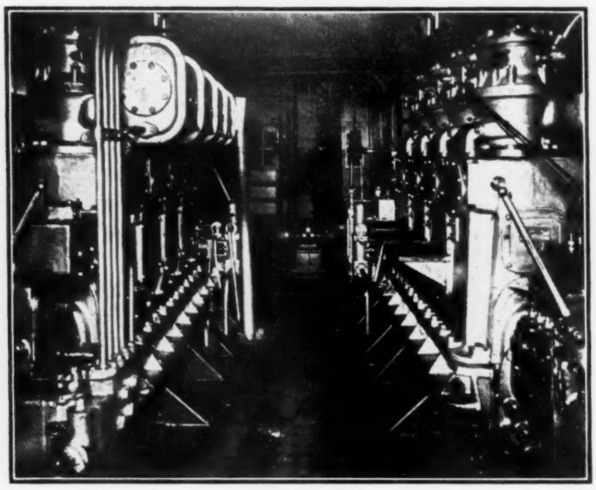
Officials of T. L. Herbert & Sons on the "Harvey"

will start, stop and reverse under full load and without the use of a clutch, having all the "handy" properties of a steam engine. The writer timed one and found it was only three seconds (as nearly as one could catch it without a stop watch) from the time the bell was rung until the engine was in full motion, either forward or reverse. This quick starting is by means of compressed air.

The power is conveyed to the stern wheel, or rather wheels, for there are two

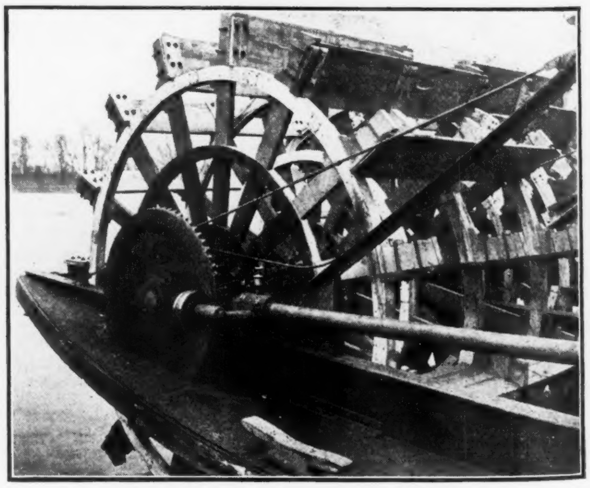


Twin Diesel engines on the "Harvey"



Another view of the engine room of the "Harvey"

Roller chain drive from engine shaft to wheel shaft

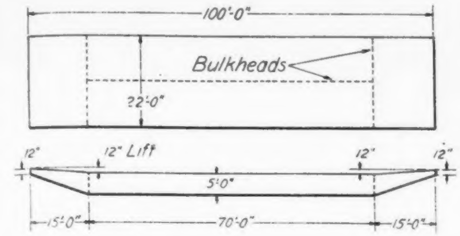


Paddle wheel and gear drive

of them side by side, through 4-in. shafts in adjustable bearings that run straight back from each engine. There is only flexible coupling in each shaft and that is at the engine. The speed of these shafts is reduced by a roller-chain drive (Link-Belt), which drives a short shaft on the end of which is a pinion. This pinion drives a 60-in. gear fastened on the wheel shaft.

The wheel shaft is 8-in. through and of octagon shape except at the bearings. The wheels are 16 ft. in diameter and have paddles 2 ft. deep. This is a very large wheel for the size of the boat, which is 92x22 ft., but it is good engineering to make it large, for the small wheels lift the water as well as push against it and in that way waste a good deal of power. One can see this easily by watching the wheel of the Harvey and noticing the small amount of water that is raised in comparison with the ordinary wheel.

The purpose of having a wheel for each engine is primarily to help in turning with the current and similar maneuvering. This is borrowed from an old steamboat practice. But the actual steering is done by four shallow rudders at the stern, as in most stern-wheel boats. These rudders are hung to posts which move in ball bearings, a detail showing the refinement of the design.



General dimensions of barge

The boat usually pushes two or three barges before her and can handle four. Going with the current with the empty barges she makes 10 miles per hour, but on the return trip the speed falls to three.

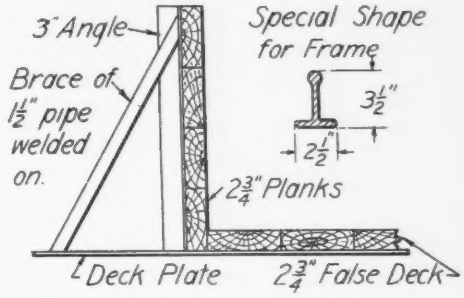
Under date of July 8 W. H. Herbert informs the writer that the *Harvey* has been operating continuously since it was put into service. It has made the trip from Nashville to Paducah, Ky., on a continuous run there and back, amounting to about 500 miles. No trouble whatsoever was experienced.

Dredge Boat "Bertha"

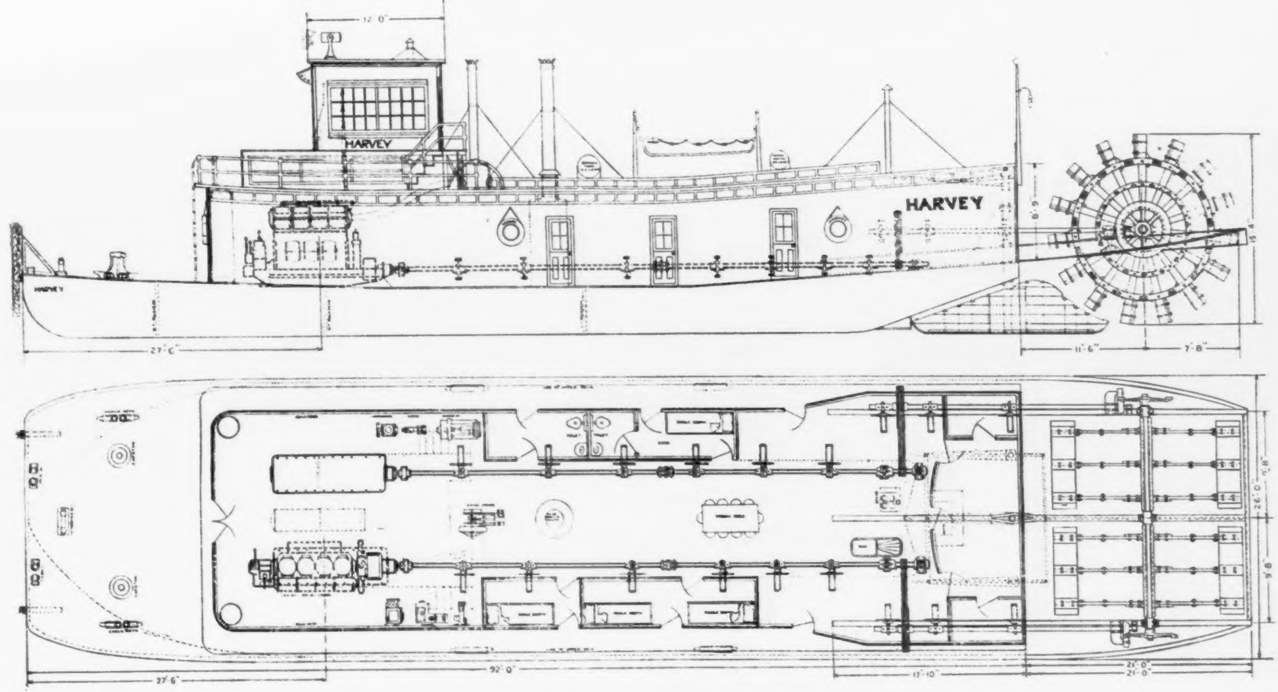
The sand and gravel is pumped by a 12-in. Morris pump on the dredge *Bertha.* This boat has been in the Herbert service for a good many years. She is self propelled and did her own towing for a long time.

The material pumped from the river bars goes to a revolving screen which has a screen baffle at the far end against which a part of the discharge strikes. This gets rid of some sand and a part of the water and makes better screening in the main screen. Two sizes of gravel and one of sand are made and these flow by gravity to barges, a sand barge on one side and a gravel barge with compartments on the other. Excellent living quarters for the crew are provided.

The *Bertha* will shortly be given honorable retirement from service, as she is to be superseded by a new dredge now under construction. This will be a dipper dredge of unusual type. It will have two clamshells suspended from booms on either side which will dump into a central hopper. The sand and gravel will be screened by Hum-mer screens and the gravel will be cleaned by a special device for removing sticks and other trash with which the Herberts have been experimenting for some time. The dipper dredge would seem to be better adapted to this river than a pump, as the bars are comparatively shallow and somewhat "pockety."



Detail of barge construction



Elevation and plan of the towboat "Harvey"

From the experience gained in towing with the *Bertha* and other steam tow boats, it is already proven that the Diesel engines on the *Harvey* will work at a very much reduced fuel cost as compared with any steamboat. These engines were guaranteed to deliver a horsepower hour for 0.49 pints of fuel oil, but they have done considerably better than that. With the saving from the new design of barge it can be seen that the transportation charges have been cut to a small fraction of the original cost.

Mr. Herbert believes in water transportation and thinks there is a good field for

it if modern engineering practice were to be followed. By using Diesel engines the fuel cost would be greatly reduced and by putting in proper cargo handling arrangements at the landings the labor would be cut down. The success of the government barges on the Mississippi would seem to bear out his views.

To Promote Use of Agricultural Lime in Alabama

BEGINNING this fall practical demonstrations as to the value of lime on different crops will be conducted in a large number of Alabama counties, according to Edward A. O'Neal, president of the Alabama Farm Bureau.

In making this announcement, Mr. O'Neal said that more economic production is an important farm bureau project and that it is hoped that these limestone demonstrations will reveal information as to how the cost of producing crops be reduced. With this idea in mind, Mr. O'Neal requested the Tennessee Coal, Iron & Railroad Co. and the McDonough Ore & Mining Co. of Birmingham, to donate enough lime for sufficient demonstrations in each county which they have agreed to do. The only charge will be enough to cover the cost of loading, lime being a by-product of these two corporations.

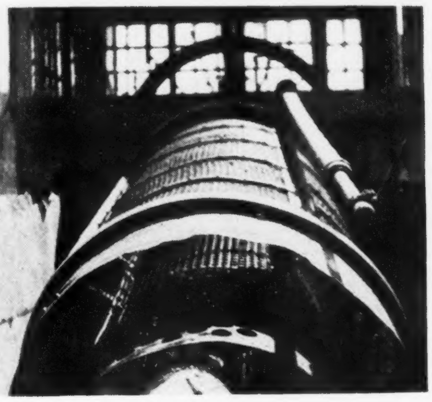
Following this offer, Mr. O'Neal took the matter up with the officials of the railroads serving Alabama and to date the following have agreed to haul it without cost: L. & N., C. of Ga., I. C., Western of Alabama and M. & O. These railroads agree to haul free one car for each county along their lines.

The idea was heartily endorsed by officials of Auburn who are anxious to see lime given tests such as are proposed in the farm bureau project. County farm bureau officials in co-operation with the county agent in each county will make such local arrangements as are needed.

In further comment on it, Mr. O'Neal said that it is in line with the farm bureau program announced by him immediately after he was elected president and printed in the June 1, 1923, issue of the *Farm Bureau News*, as follows:

"To study, in co-operation with the Alabama Extension Service and other divisions of the Alabama Polytechnic Institute at Auburn, production costs with a view to determining the most efficient methods of production; standardize agricultural products for the purpose of placing them on the highest quality basis; and co-operate in the conservation of all agricultural products." —*Birmingham (Ala.) News.*

Dredge "Bertha," Cumberland River, of T. L. Herbert & Sons



Screen on dredge "Bertha"

Cinders Growing Scarce in New York

THE Dow Service bulletin points out that cinders for concrete aggregate are becoming scarce in New York owing to the increased use of oil burning in power plants, apartment houses and other places where fuel is used in large quantities. Cinder concrete has been largely used in New York for fireproofing and this scarcity will compel the use of other materials such as sand and fine gravel.

Towboat "Harvey" and tow of gravel barges on the Cumberland River

Modern Methods and Processes of Mining and Refining Gypsum*

Part III—Screening, Air Separation and Grinding

By Alva Warren Tyler

IT WAS stated in Article 2 (July 12, 1924 issue of Rock Products) that electric vibrating screens as well as air separators had been successfully used in gypsum manufacture. Earlier practice used screens of various types—the "homemade shakers," or "knockers" being among the most common forms found among the larger producers. These at the best were crude affairs and only served to scalp off the coarser par-

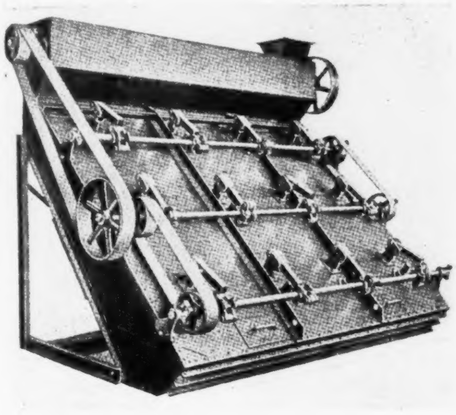


Fig. 1—Older type of vibrating screen

ticles. The ever increasing demand for quality products necessitated more refined equipment and the development of the mechanically vibrated screens (Fig. 1) with dust-proof housings proved an important step toward supplying this demand.

More recently the electrically vibrated screen (Fig. 2) has come greatly into favor due both to its efficiency and comparatively large capacity. It might be mentioned here that this type of screen is also a pronounced success for handling crushed gypsum rock where sizing for either outside storage or crushed gypsum rock shipments as its capacity is enormous while floor space and head room are both reduced to a minimum.

A screen of any kind, however, is limited in its application on pulverized gypsum due to the fact that above a certain fineness screen troubles rapidly begin to appear in the way of decrease in capacity and eventual choking entirely of the screening surface. A 30- to 40-mesh screen is about the practicable limit of screen fineness without prohibitive increase of screening surface.

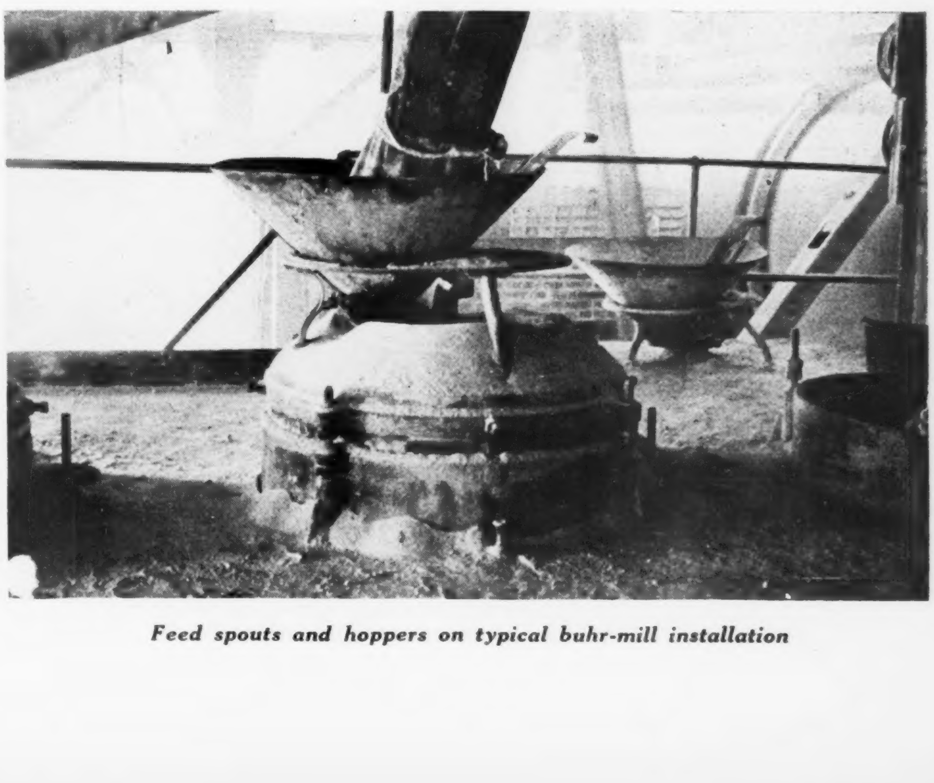
Where it is necessary to obtain a greater fineness than can be had practically by the use of screens, air separation must be resorted to. There are a number of success-

Fig. 2—Recent type of electrically vibrated screen

fully operating air separators (Fig. 3) which may be regulated to produce within certain practical limits the desired fineness. A special sizing of dry pulverized gypsum is sometimes required after passing the hammer mill for the supplying of the portland cement trade, the specifications for which in some cases call for a product having not more than 15% of fines passing a 100-mesh sieve and all of which will pass a ¼-in. to ⅜-in. mesh sieve. This usually necessitates a double-deck screen at the top of the elevator delivering from the hammer mill, the upper deck scalping off the oversize exceeding the higher limit, and the lower deck taking out the excessive fines. These fines can ordinarily bypass the grinding equipment and deliver directly to the land plaster bins. The middle product is deliv-

Fig. 2a—Another recent type of electrically vibrated screen

ered either to a bin from which it is drawn for carload shipments in bulk or to the cars direct by means of a conveyor. The process of loading the car is taken care of



Feed spouts and hoppers on typical buhr-mill installation

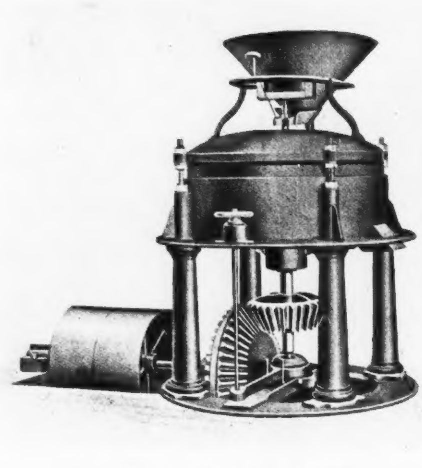
by means of a centrifugal loader or portable belt conveyor loader.

The oversize rock from these screens is delivered to the grinding bin as is also the middle product referred to above when not needed for bulk shipments of green rock.

Grinding

The grinding bin may be of any suitable size or shape. It is an advantage, however, to have this bin of comparatively large capacity, as the larger the bin the less liable to have the plant shut down, due to the dryer or other troubles between the grinders and the crushed-rock storage. The shape of the bin supplying the dry rock to the grinders should be such as to allow a free flow to these machines. It is very characteristic of gypsum rock, however, particularly when there is an appreciable amount of finer material, to hang up in the bins to such an extent that it is often necessary to have an attendant at this point to keep the material flowing freely. A device had been used which will be described later, to take care of this condition and eliminate this attendant.

There are several types of grinding machines on the market for gypsum rock, but the grinding process has been almost universally confined to two types of machines; mill stones and roller mills with the air-separating system in connection. Mill stones are probably the oldest type of machines successfully used for grinding gypsum rock on a commercial scale. These have been



Typical modern buhr-mill

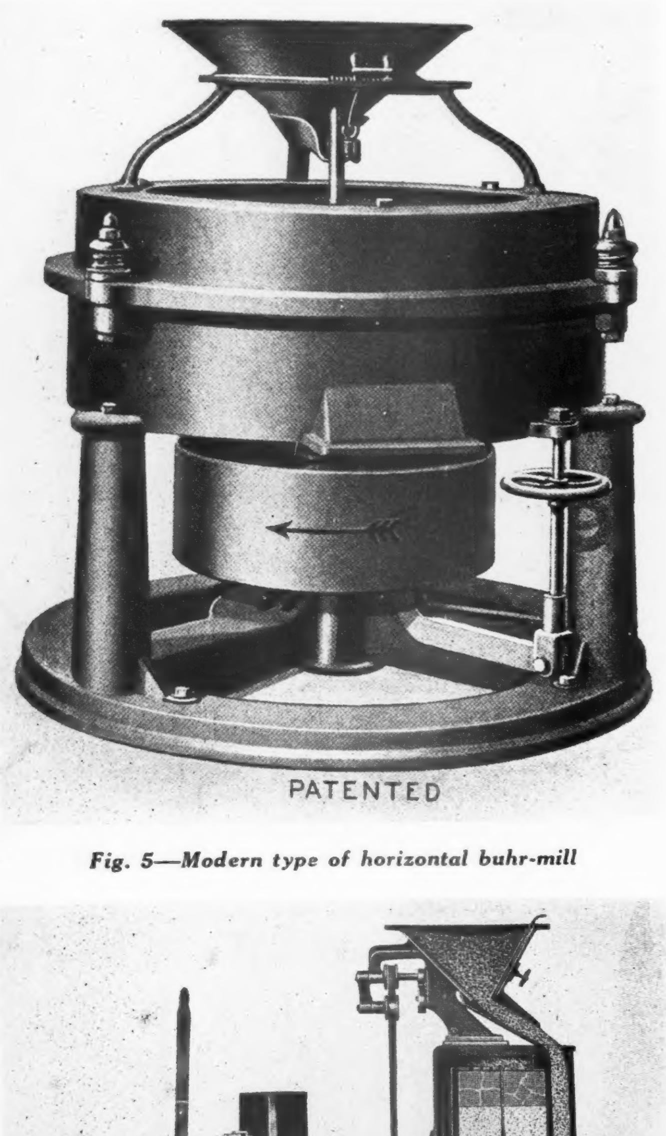


Fig. 5—Modern type of horizontal buhr-mill

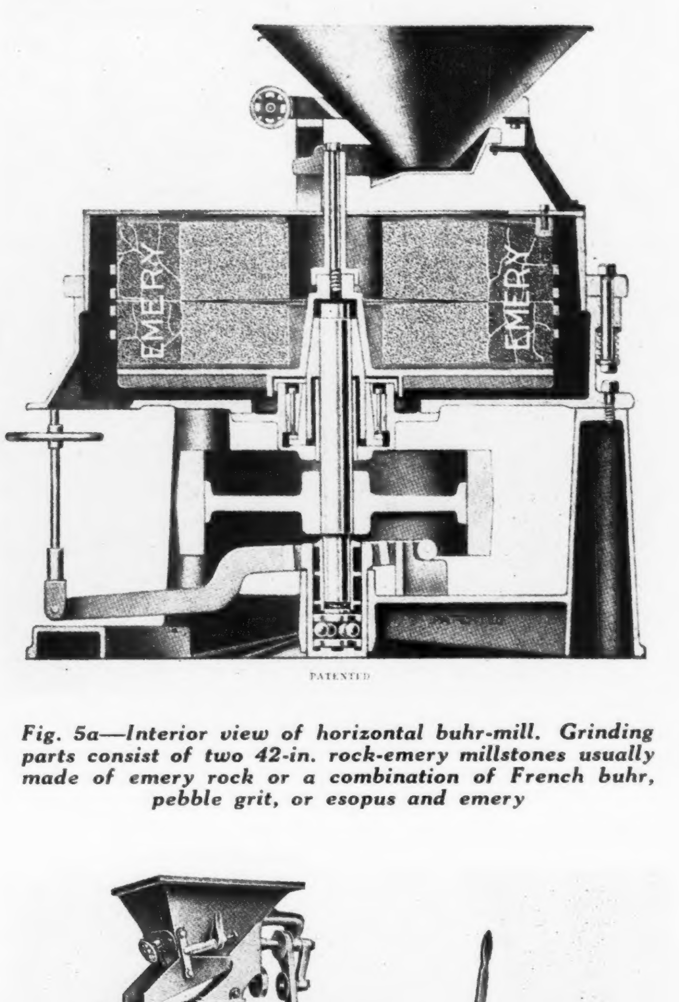


Fig. 5a—Interior view of horizontal buhr-mill. Grinding parts consist of two 42-in. rock-emery millstones usually made of emery rock or a combination of French buhr, pebble grit, or esopus and emery

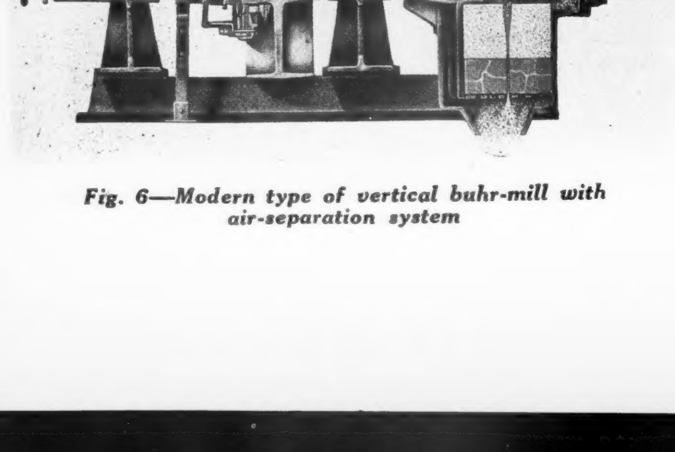


Fig. 6—Modern type of vertical buhr-mill with air-separation system

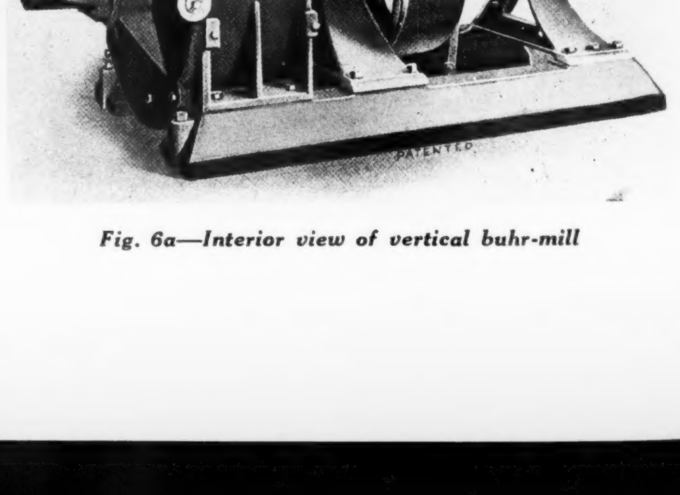
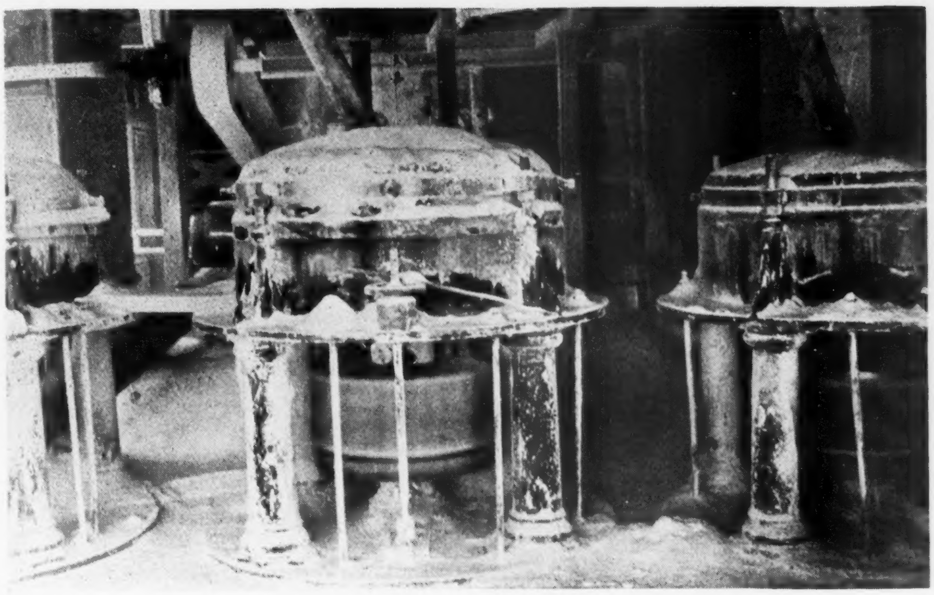


Fig. 6a—Interior view of vertical buhr-mill



Buhr-mill installation showing belt drives

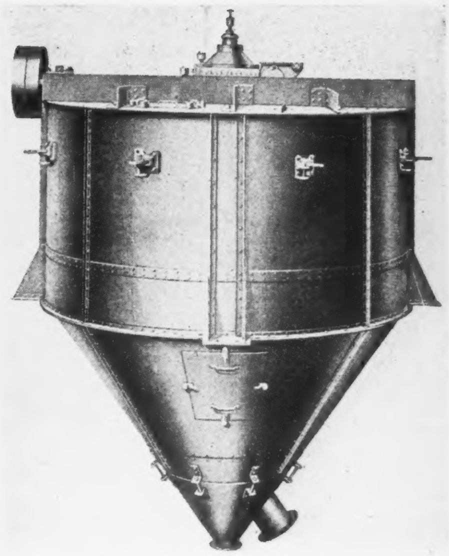


Fig. 3—One type of air separator used

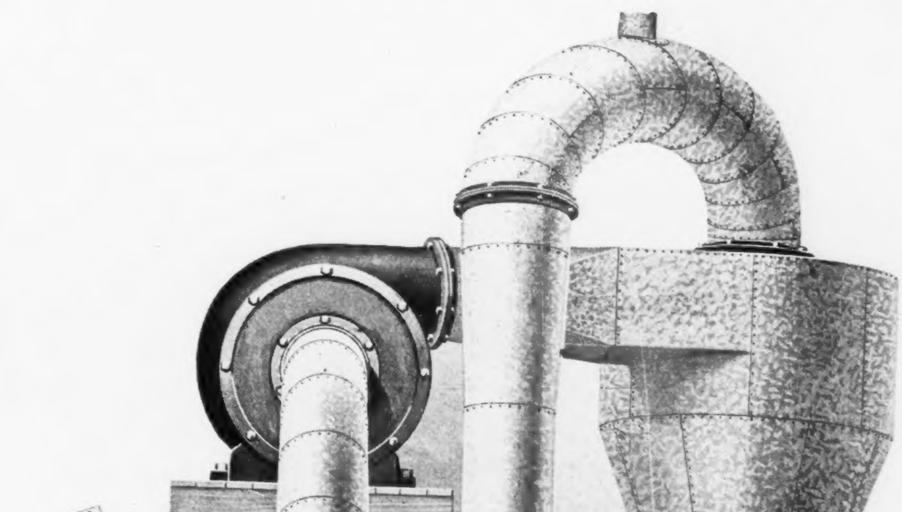


Fig. 7—Recent type of roller mill with air-separation system

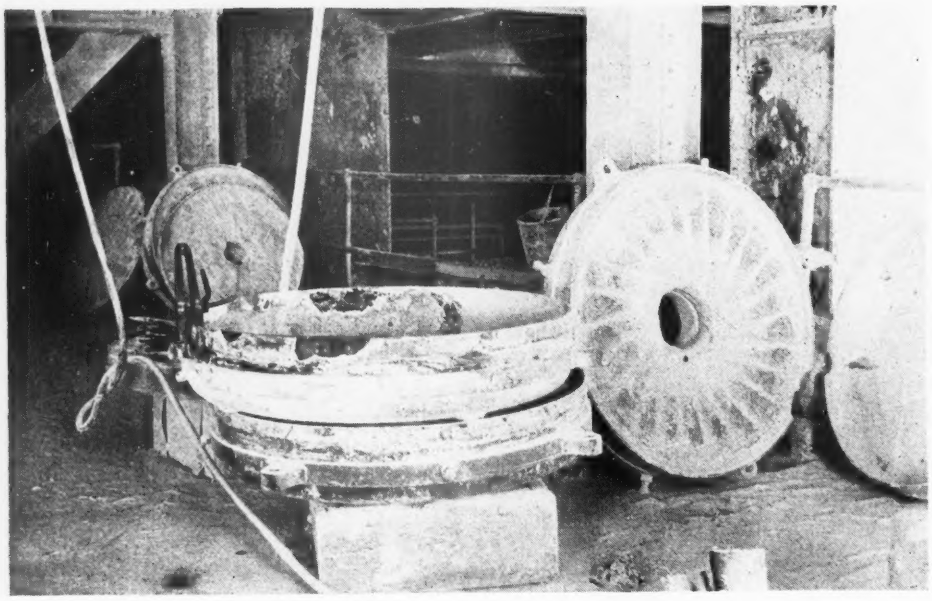
and are still being successfully used both in the vertical and horizontal types (Figs. 5 and 6).

The French buhr stones are probably the best type of stone for this purpose although the Aesopa stones are also very successfully used. This class of stone is much cheaper and is practically as efficient in grinding although it requires dressing more frequently than does the French buhr stone.

Air separators have to some extent given mill stones a new lease on life since by delivering from the mill stones to air separators and returning the oversize to regrinders, a much finer grade material is produced.

The most modern method of grinding gypsum rock is by the use of the roller mill and air separator combined. (Fig. 7). This machine not only grinds very efficiently but due to the air-separating system, used in combination, a very uniform product is obtained. The fineness of the product may be regulated almost at will and this fineness may be carried to a much higher point than can be practicably obtained by the use of mill stones.

The advantage of the combined roller mill and air-separating system over the mill stones, is very apparent, since it is a self-contained unit very simple in design and, from the standpoint of uniformity of product, very efficient. The capacity of a 4-roller mill is from 3 to 3½ times the capacity of a 36-in. horizontal under-runner mill stone besides delivering a more uniform and finely ground product. The power requirement for the roller mill is possibly a little higher when considering the output, but the upkeep is lower as there are no mill stones to dress, although of course it is necessary to replace rings and rollers occasionally. On pure gypsum rock this is very seldom, whereas, if the rock contains flinty material, such as is found in the Ohio and lower Michigan districts, these rings and rollers wear quite rapidly and sometimes need replacing as often as once in six months. The very uniform product obtained, however, more than offsets these



Buhr-mill stones out for reshaping

objectionable features and it has been apparent to the producers that a finer product than is possible to obtain by mill stones is more acceptable to the trade.

Automatic feeding of both classes of grinding machines is necessary and this has been worked out very successfully and efficiently. In the case of mill stones the ground product is delivered by means of conveyors and elevators to what is commonly known as "land plasters" bins.

The ground product is known to the producers as "land plaster," this name having originated in the early days when gypsum was better known as a soil fertilizer than as a building material. The more modern term for gypsum to be used as a fertilizer is "agricultural gypsum."

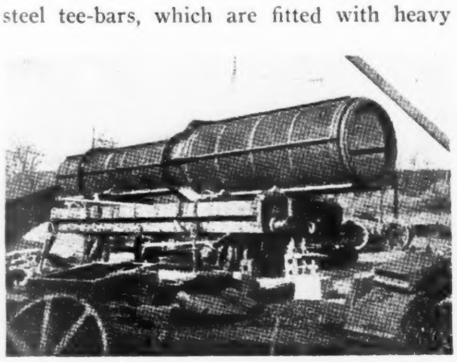
In the case of the roller mills having the air-separating system, no elevators and conveyors are necessary as the dust collectors on the roller mills deliver directly to these bins. When fertilizer shipments are provided for, arrangements are made to sack the material directly from the land plaster bins and deliver to cars. Land plaster is sometimes shipped in bulk in which case it would be delivered to the cars by means of a conveyor provided for this purpose at the head of the land plaster elevator.

(The next article will describe calcining operations)

A British Chain Hung Screen

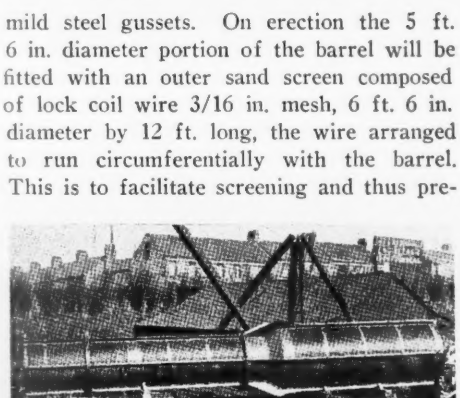
THE illustrations, reproduced from the British *Quarry Managers Journal*, show a type of screen that seems to be in regular use in Great Britain, although it is hardly known in the United States. The unusual (to us) feature is the suspension of the screen in loops of chain instead of carrying it on small rollers, as is the usual practice where no central shaft is employed.

Total length over all is 34 ft.; the first 12 ft. feed end is 5 ft. 16 in. diameter and is perforated with 7/16 in. diameter holes; the last 22 ft. is perforated ¾ in. diameter and 1⅜ in. diameter holes. There is a cast steel cone which connects the 5 ft. 6 in. diameter with the 4 ft. diameter; the cone is fitted with internal lifters which raises the material from the larger diameter to the smaller. The barrel is built up on mild steel tee-bars, which are fitted with heavy



The screen dismounted

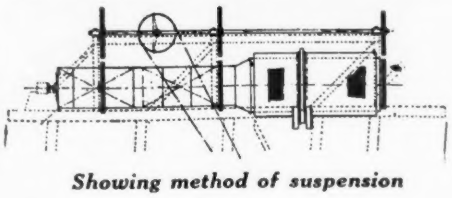
mild steel gussets. On erection the 5 ft. 6 in. diameter portion of the barrel will be fitted with an outer sand screen composed of lock coil wire 3/16 in. mesh, 6 ft. 6 in. diameter by 12 ft. long, the wire arranged to run circumferentially with the barrel. This is to facilitate screening and thus pre-



Note conical reducing section

vent clogging of the wires. The wire mesh is secured to the barrel with pipe distance pieces and bolts, and is made in six segments rolled to suit the 6 ft. 6 in. diameter. The 5 ft. 6 in. diameter of barrel has a cast-iron bevelled roller ring fitted (in halves), the ring being carried on two cast-iron bevelled rollers; the rollers are made adjustable to suit the chains; the ring is required to take any extra weight on feed end of screen. This is shown on line illustration.

Suspended screens are not entirely unknown in this country. The Hoover & Mason Phosphate Co.'s plant has a washing screen suspended in loops of wire cable



Showing method of suspension

which has proven satisfactory in operation.

The use of two sizes of cylindrical screens, connected with a conical reducing section, shown in the pictures, would insure the retension of considerable material in the first section. This, combined with the lifters in this section, would make the screen a good scrubber.

Rates on Cement

EXAMINER P. F. GAULT in a tentative report on No. 14126, Cape Girardeau Portland Cement Co. vs. B. & O. et al., has recommended that rates on cement from Cape Girardeau (Gulf Junction), Mo., to points in Illinois be found unreasonable and unduly prejudical and that rates for the future be prescribed. Complainant alleged that the rates on cement from Cape Girardeau to points in Illinois, on and south of the B. & O. from East St. Louis, Ill., to Vincennes, Ind., were unreasonable, and, as compared with rates from LaSalle, Oglesby and Dixon, Ill., to the same destination territory, were unjustly discriminatory and prejudicial.

The examiner said the Commission should find that the rates from Cape Girardeau (Gulf Junction) to points in the destination territory in issue are, and for the future, will be unreasonable and unduly prejudicial to the extent that they exceed or may exceed those which would result under the scale prescribed in Atlas Portland Cement Co. vs. C. B. & Q. 81 I. C. C., 1, decided June 6, 1923, from the Illinois mills to points in Illinois, applied in the same manner and under the same formula for computing distances as applied in that case, as modified by the supplemental order therein, of August 22, 1923. He said where traffic was handled by the Chicago & Eastern Illinois as far as Thebes only, that carrier should not be counted, as its service was in effect a switching movement from Illmo to Thebes. He said the finding should not preclude the Frisco and Chicago & Eastern Illinois, however, for operating purposes from interchanging traffic at Chaffee as at present.—*Traffic World*.

Mining and Quarrying Compared by an Engineer Familiar with Both Operations

Part 5—Mining Limestone with a Dip of 60 Degrees from the Horizontal

By J. R. Thoenen, Member A. I. M. E.

THIS is a continuation of the descriptions of typical limestone mining operations begun in the August 9 issue of Rock Products.

Plant (C)—Mining an Inclined Stratum

At this plant limestone is mined for furnace stone, open-hearth stone and for burning to lime.

The limestone stratum or vein dips at about 60 deg. from the horizontal and is about 75 ft. thick. At this angle it is obvious that open-pit operations could be carried on only along the length of the outcrop of the stone, for if carried across the formation the overburden would very soon prohibit further operation, therefore some system of underground mining becomes compulsory.

The problem has been solved here by sinking a shaft in the footwall and recovering the limestone by regular shrinkage stope mining. Fig. 8 in the preceding article illustrates the method used.

The first cost or development cost of mining by this method is necessarily high because of the amount of so-called dead work necessary. This is overcome to a large extent in later operation by the absence of either hand or mechanical loading cost.

The first step necessary in this method is the sinking of the shaft. In this particular case the shaft was sunk some distance in the footwall in an inferior grade of limestone and on an incline parallel with the angle of dip of the good stone. The shaft has three compartments, two for skipways and one for a manway and air and water pipes. Skips are hoisted in balance.

At intervals of from 125 to 130 ft. vertically tunnels or crosscuts are driven to the good stone. Formerly the intervals between crosscuts were 60 to 85 ft. These crosscuts were necessary under the first type of mining adopted, which they termed "open-chamber" work. Under the present stope shrinkage method of mining, only the second and fourth levels are used, the first and third having been abandoned. When the stone to be mined is reached, levels 12 ft. wide and 10 ft. high are driven along the footwall of the vein or stratum. Their length is limited by the property lines or economic hauling

Mine entrance (left), crushing and rotary-kiln lime plant (right) of the American Lime and Stone Co., Bellefonte, Penn.

distance from the shaft. When the distance to haul becomes excessive other shafts are sunk. It is easily seen that with a crushing plant already built at one point the distance rock can be hauled underground is considerable, for were other shafts sunk to shorten the underground haul there would still remain the surface haul from the new shaft to the crushing plant. The difference between the cost of underground and surface haulage with the added transfer of material is not of great moment where locomotives are used underground.

When the levels have been driven some distance each way from the shaft small raises are driven at about 25 ft. centers up the footwall. These raises are driven about

lar plant differ from the sketch. The drawing shows a long stope raise driven from the center of the stope or room to the next level above with overhead mining proceeding in both directions from the raise. Here, the practice is to drive the stope raise at one end of the stope and carry the drilling or breaking operation in one direction only.

Manways are left from the level below to the stope and the stope raise is also used as a manway. Thus easy access is afforded as well as good natural ventilation.

The stone broken from the back of the stope is left to accumulate and only that amount drawn which is equivalent to the increase in space occupied by the broken stone over that in the solid. By spacing the chutes at short intervals the heighth of the broken stone in the stope can be accurately controlled.

Drills used are the air-hammer type mounted on single-jack mine columns. The

are 260 ft. in length and 55 ft. in width normal to the walls.

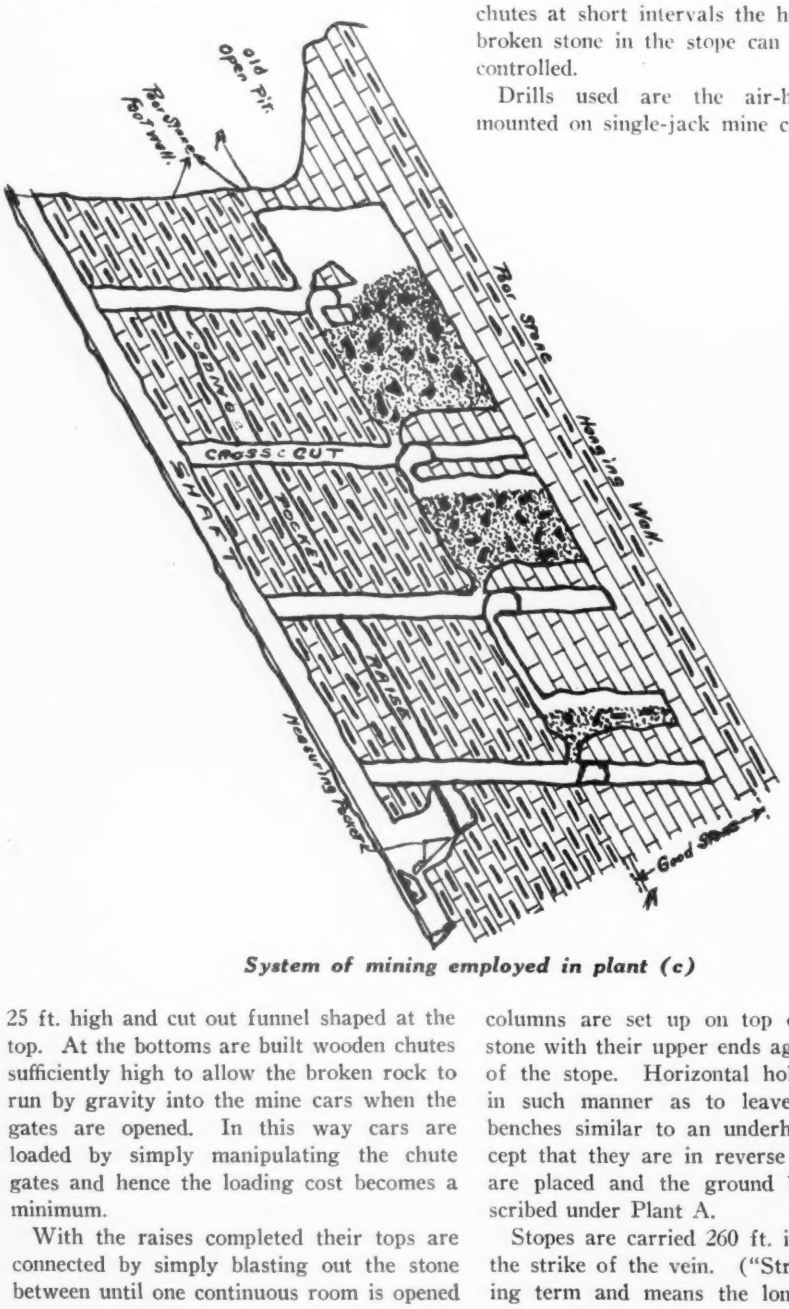
Pillars are left 40 ft. wide along the strike and are continuous from the top to the bottom of the mine except that levels are driven through them. These correspond to the rib or chain pillars of the flat deposits.

In driving level tunnels 18 to 22 holes are drilled, using the ordinary center or V-cut. When blasted the rounds average an advance of 6 ft. Two drills are used in each heading and they drill and blast a round in eight hours.

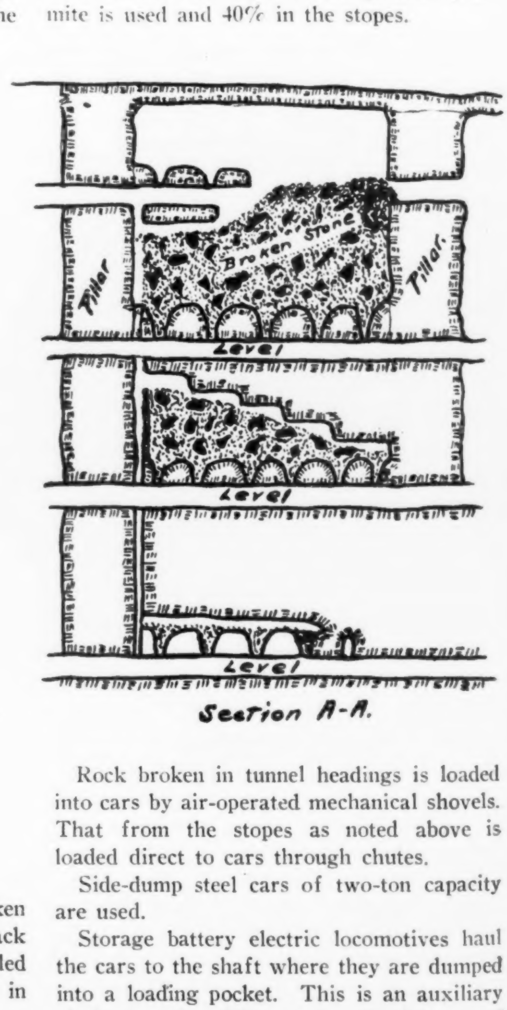
One-inch quarter-octogan solid, 1⅛-in. hollow hexagon and 1¼-in. hollow round steel are used, depending on the operation. All bits are four point double taper, machine sharpened.

For driving the raises the stoper type of air hammer drill is used.

In driving level tunnels 60% gelatin dynamite is used and 40% in the stopes.



System of mining employed in plant (c)



Section A-A.

25 ft. high and cut out funnel shaped at the top. At the bottoms are built wooden chutes sufficiently high to allow the broken rock to run by gravity into the mine cars when the gates are opened. In this way cars are loaded by simply manipulating the chute gates and hence the loading cost becomes a minimum.

With the raises completed their tops are connected by simply blasting out the stone between until one continuous room is opened approximately 25 ft. above the level below. Referring now to the sectional view of Fig. 8 operations so far described are illustrated by the lower left hand portion of the sketch (longitudinal section).

From here on operations at this particu-

columns are set up on top of the broken stone with their upper ends against the back of the stope. Horizontal holes are drilled in such manner as to leave the back in benches similar to an underhand stope except that they are in reverse order. Holes are placed and the ground broken as described under Plant A.

Stopes are carried 260 ft. in length along the strike of the vein. ("Strike" is a mining term and means the long way of the vein.) Twenty feet of good stone is left on the hanging wall or upper side of the vein to hold a softer stratum above. This is similar to the practice in Plant A of leaving 15 ft. of good stone to carry the overlying dolomite. Therefore stopes or rooms

Rock broken in tunnel headings is loaded into cars by air-operated mechanical shovels. That from the stopes as noted above is loaded direct to cars through chutes.

Side-dump steel cars of two-ton capacity are used.

Storage battery electric locomotives haul the cars to the shaft where they are dumped into a loading pocket. This is an auxiliary shaft or raise driven from the bottom of the mine to the upper level. At its lower end (below the lowest level) it discharges broken rock through a chute into a measuring pocket which holds just a skip load or five tons. This loading pocket is connected with each level so that all rock dumped into it falls to the bottom or skip loading level. Thus all hoisting is done from one point and not from each level.

Pumps handling 1000 gal. per minute and working three hours daily effectually dewater the mine. The cost of handling water in

this type of mining naturally becomes greater with greater depth both because as a rule the water encountered increases with depth and also because of the constantly increasing head to which the water must be elevated.

In driving level tunnels approximately one-third of a ton of rock is broken per foot of hole drilled, while in the stopes each foot of hole produces two tons of rock.

In the stopes three tons of rock are broken per pound of explosive.

Approximately 18 tons of rock were produced per man underground per day at the time of the writer's visit. At that time all the tramming was done by hand, requiring 15 to 20 men. Storage-battery electric locomotives have since been installed which eliminates about 15 men. With storage batteries in use there are about 40 men in the mine and production is about 1000 tons per day or 25 tons per man per day. It is estimated that from 90 to 125 tons of rock per day per driller in the stope is obtained.

When brought to surface the rock is dumped over a 10-in. grizzly and the stone for lime burning taken out. The undersize passes to a 500-ton bin and is loaded out through air-operated, double, under cut arc type gates to small cars and hauled by steam locomotives to the crushing plant.

Drilling in plant (c)

Based on 100% for total cost per ton of stone costs are as follows:

Stripping	0.0%
Development	18.0%
Explosives	7.2%
Labor	36.1%
Supplies	12.1%
Power	6.0%
Depreciation	8.5%
General Expense	12.1%
	100.0%

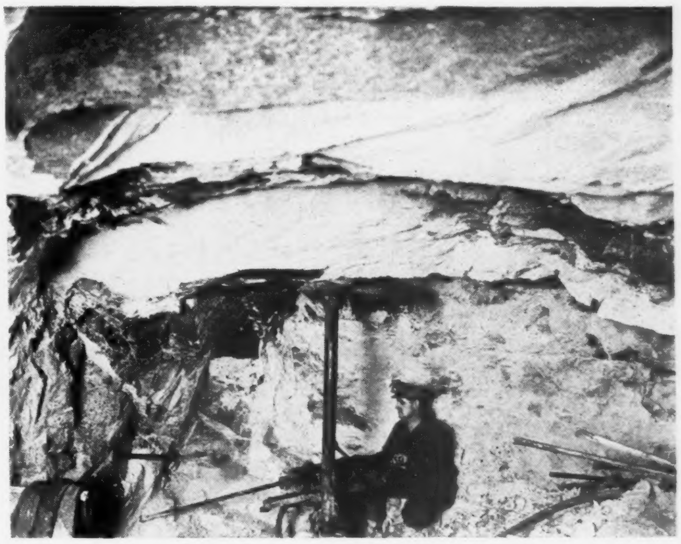
The item "Development Cost" as given above includes the cost of driving levels and raises but not the cost of the shaft. In this type of mining this cost might be termed analogous to the stripping cost of the open quarry.

(To be continued)

Alabama Cement Rates Hearing

HEARING on cement rates, as part of the general freight rate investigation being conducted by the Alabama Public Service Commission, was held on September 2.—*Birmingham Age-Herald.*

A level in plant (c)



Starting a hole in the breast

Looking down into the loading pocket

Taking stone out of the loading pocket

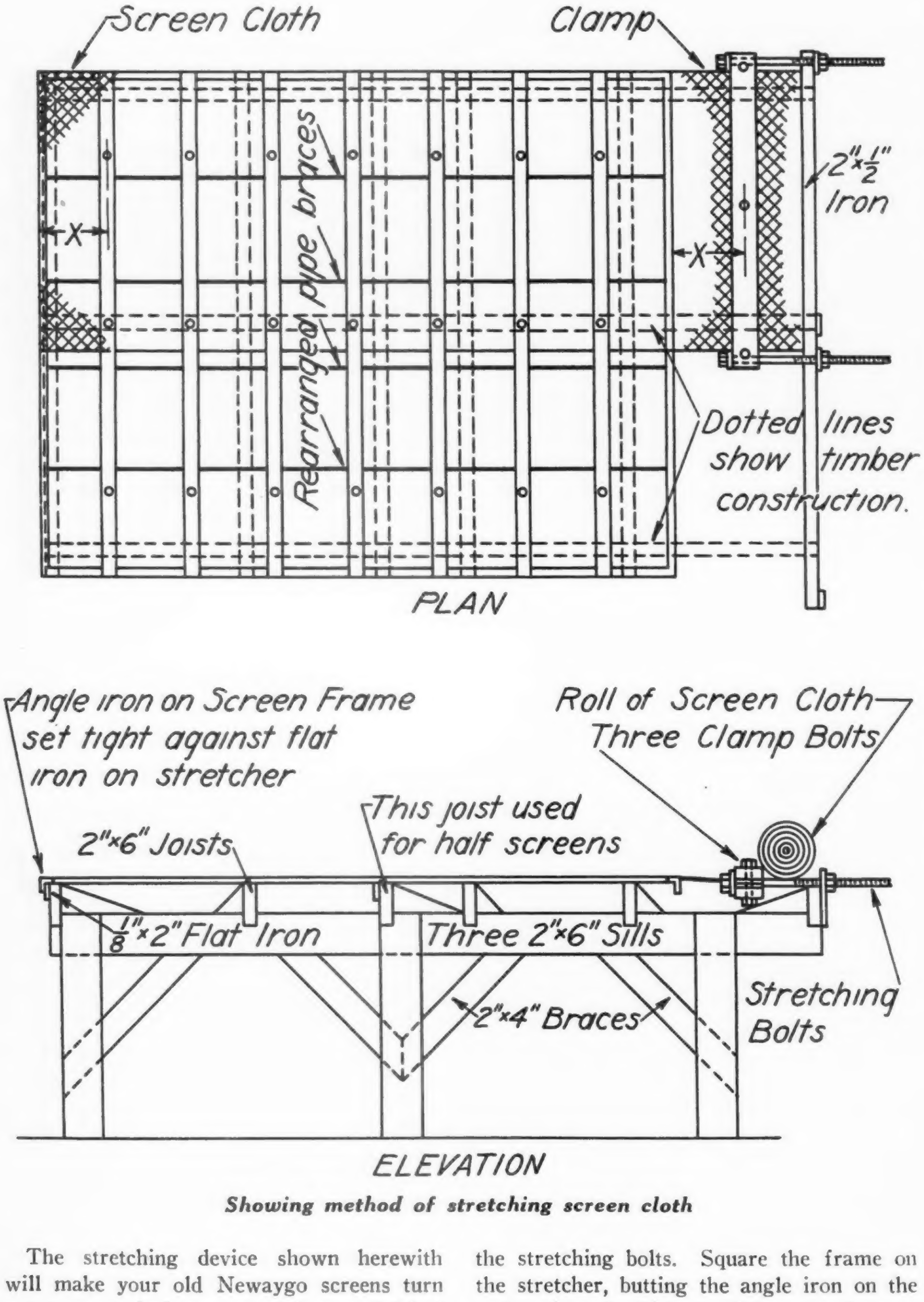
Hints and Helps for Superintendents

Stretching Screen Cloth on Newaygo Screen Frames

By WALTER DOLL

Superintendent, Sheldon Slate Products Co., Granville, N. Y.

IN these days of modern screening machines, we, who cannot afford to replace our old equipment with new, are forced to use every resource to keep our plants on a competitive basis with those which are so equipped.



Showing method of stretching screen cloth

The stretching device shown herewith will make your old Newaygo screens turn out a great deal more, and better, finished product than ever before. In fact, providing the rest of the screen is in good mechanical order, it will put the Newaygo in such condition that one may reasonably hesitate about making any replacement at all.

The stretcher is constructed of 2x6-in. timbers braced with 2x4's. The sketch showing its application is self-explanatory. The outline of procedure is as follows: After re-arranging the pipe braces on the screen frame as shown, set the frame on the stretcher. Rivet the cloth to the angle iron end of the frame farthest distant from the stretching bolts. Square the frame on the stretcher, butting the angle iron on the end against the ⅛-in. by 2 in. strap iron on the stretcher. Put clamp on cloth, square with frame, at a distance X from the end of the frame as shown. Tighten up on stretching bolts. Rivet cloth to frame. Cut off surplus cloth flush with end of frame. In covering the rest of the frame, the hole made by the central clamp bolt will come directly over the first strap on the frame. It is necessary to use this bolt to get an even tension over the entire surface of the cloth. A small piece of sheet iron or screen cloth over this hole will stop any possible leak. When putting on the second piece of cloth, lap 2 in. in the direction of flow.

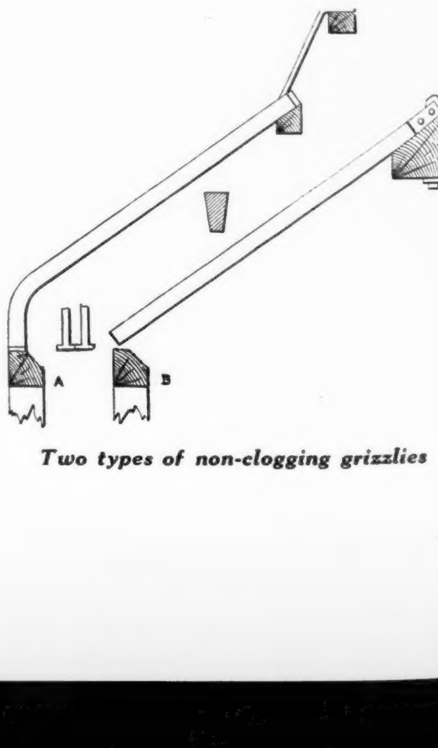
The results are, no waste cloth, an approach to drum head tightness, longer life to the screen cloth, greater capacity for the screen and better and more economical grading of the product.

Our stretcher is arranged to handle the half-section frames in the same manner as above with this exception. As the angle iron on these frames points up instead of down, we bolt on a piece of flat iron to pull against.

Non-Clogging Grizzlies

TWO types of grizzlies have been developed at the Alaska Juneau mill in an endeavor to obtain a non-clogging grizzly. The type A consists of a bar of tapered cross-section which is curved as shown at the discharge end. The lower ends of the bars are upset and widened out so as to give the proper spacing between the bars. The upper ends are held by a rod and spacers.

The length of the grizzly is relatively short. In the second type the upper ends of the bars are held by rods and spacers and the grizzly is firmly attached to the upper support. The lower ends of the grizzly bars are free and unsupported. This arrangement allows the bars to spring apart slightly under impact, assisting in keeping the spaces clear. The length of this type is relatively short. —*Engineering and Mining Journal-Press.*



Two types of non-clogging grizzlies

Water Ejector for "Siphoning" Barges

MANY sand and gravel barges on the Ohio river are of the hopper type. These do not permit the water to drain off from the sand and gravel while it is being loaded as the flush deck type barges do, and when the hopper barge arrives at its destination there is often as much as four inches of water in the bottom of the hopper.

R. M. Holland and his water ejector for siphoning sand and gravel barges

When steamboats were used for towing the regular method of pumping out this water was by the use of a "steam siphon." This was an ordinary injector much like that used for filling boilers. Steam was supplied from the boilers of the steamboat.

Gas engines were substituted for steam engines on the new tow boats and at once the problem arose of pumping out the barges, since steam was no longer available for the siphons. In some cases small centrifugal pumps were installed and in other cases the siphons were still used, the steam, however, being supplied from the boilers of the hoisting engine at the landing.

R. M. Holland, river superintendent of the Ohio River Gravel Co., at Parkersburg, W. Va., devised a "siphon" that was operated by a water jet instead of a steam jet, and this is shown in the accompanying picture. The construction is simple. A 3-in. Tee is reduced to a ¾-in. nipple and the water hose is attached to this. On the opposite arm of the Tee is the discharge pipe, a plain piece of 3-in. pipe of any length. In the other arm of the Tee is screwed the suction pipe. On the lower end of this is a sheet-iron cone closed at the bottom and perforated. This keeps the larger pieces from entering the suction.

Mr. Holland used a small piston pump to supply the water and this gave a pulsating discharge. The "siphon" did not work well until he put a clack valve inside the bell at the bottom of the suction. This valve opened and closed with the pulsations of the discharge and kept the "siphon" from losing its suction.

The most curious thing about this device is that Mr. Holland invented it without ever hearing or reading of the hydraulic injector. It is true that this device is not much used and is not mentioned in the ordinary engineers' pocket books. Perhaps its greatest use has been in connection with placer mining in Colorado. Mr. Holland knew that a jet of steam or air would do the work and so he reasoned that a jet of water should do the same thing and found on trying that it would.

The Ohio River Gravel Co. operates four plants at different towns along the Ohio and this system of pumping the water from the barges is used at all four. The "siphon" is also used for pumping out water that has leaked into the hull of a flush-deck barge.

A description of the water ejector, or jet elevator, as it is often called, was given in the May 20, 1924, issue of ROCK PRODUCTS and different forms are illustrated.

Carrying Sand Discharge Over Railroad Track

THE illustration shows an ingenious method of carrying the discharge of sand from a "tipple" over the loading track of the plant. Lightweight steel launders are used suspended from a steel framework which is placed high enough to conform to the railroad's requirements for a clear space above the rail. When these launders are not in use they may be pulled by a rope into a vertical position.

The launders are of light weight steel plate which makes them much easier to handle than wooden launders would be. The supporting frame is also of steel members well braced and tied.

In the picture, one launder is shown in use with three other launders out of use and in the vertical position. The "tipple" shown is that of the Muncie Sand Co., at Muncie, Kan., nine miles from Kansas City.

Method of spouting sand over tracks

Accelerated Wear Tests of Concrete Pavement

Effect of Aggregates on the Wearing Properties of Concrete

A PAPER, with the above title, by F. H. Jackson and J. T. Pauls, read at the Atlantic City meeting of the American Society for Testing Materials, is of great interest to every aggregate producer, since one of the purposes of the test was to show the relation between laboratory tests of the aggregrate used and the wear on the surface of the road. In other words it was desired to show whether or not specifications of per cent of wear, hardness, toughness and tensile strength of concrete such as aggregate producers have to meet, really describe the value of the aggregate for concrete paving.

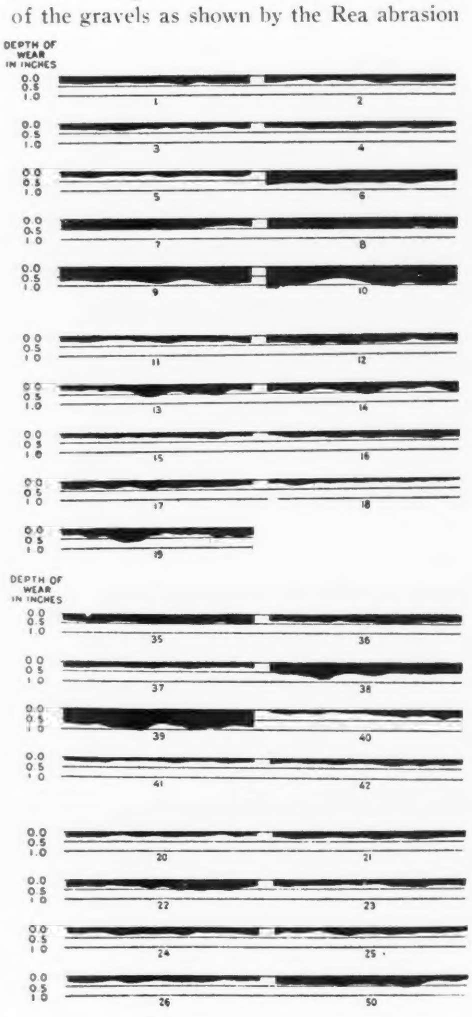
If only rubber tires passed over the road it is apparent that almost any aggregate would do, as the tests showed that "rubber tired traffic alone does not appreciably abrade the surface of a concrete pavement." But with chains on the tires the abrasion with some aggregates was very noticeable.

The test sections of the pavement were divided into several groups. The first four were to test (1) effect of quality of stone as coarse aggregate, (2) effect of quality of gravel as coarse aggregate, (3) effect of grading and quality of slag as fine and coarse aggregate and (4) effect of grading and quality of sand as fine aggregate. The remaining groups had to do with mixing, tolerance, mortar top and such aggregates as burned clay, with which Rock Products readers are not particularly concerned.

The results of the tests as summed up on page 22 are not startling nor particularly new. The moderately hard rock and gravel showed the least wear. The clean and coarse sand showed less wear than the fine sand and sand that contained considerable shale. And while it was shown that a good mortar mix would not protect a poor aggregate, it was apparent that an aggregate which would resist wear as well as the mortar was hard enough. The tests may be said to have their greatest value in confirming conclusions which have been previously arrived at by those who have studied the matter in less detail, so far as the quality of the aggregate is concerned. But it is of decided importance to learn that the tests showed that there is no consistent relation between the "tensile-strength-ratio" test for sand and the compression or transverse strength tests of the concrete. And also that there is no consistent relation between the Talbot-Jones wear test of concrete and the wear resisting properties of concrete pavement.

Profiles of the wearing tests of groups (1) to (4), explained above, are given in the report and are reproduced here. The specimens of crushed stone which were the most worn were made with a soft sandstone (No. 6), a soft limestone (No. 9) and a soft dolomite (No. 10). These were all so soft that none of them would have passed any highway materials specification of which the writer knows, the percentages of wear being 13.8,% 19.5% and 14.5% by the Deval test. It is very interesting to note the best wear record shown by the profiles was made by a moderately hard aggregate (No. 5), which was a calcareous slate with a percentage of wear of 4. It showed up even better than the hardest rock (No. 3) which was a quartzite with the low percentage of wear of 1.8.

The wear on the gravel specimens shows a lesser range of wear although the quality of the gravels as shown by the Rea abrasion test varied widely, the loss by abrasion running from 9.3% to 29.0%. The wearing tests would indicate that hardness is a more important quality than toughness, and that a pebble which might fly to pieces under a light blow would still resist wear well in a concrete pavement. No. 17 of the profiles is a case in point since the gravel from which it was made showed a loss of 29% by the Rea test and yet the wear was but little above the average for the gravel sections. It had been submitted as a gravel of doubtful quality.



Profiles illustrating pavement wear. Reference in the text is to number below each profile

It is significant in that it confirms the ordinary opinion that the gravel specimen that showed the greatest wear (No. 19) is the only specimen that is stated to have contained shale. The specimens No. 13 and 14 were from gravels that contained considerable soft sandstone, the "sandrock" which the gravel producer dreads to encounter.

Summing up, the report says: "With regard to the uniformity of wear, the moderately hard aggregates, that is, those of about the same resistance to abrasion as the mortar matrix seem to have all the best of it."

The slag sections showed a wide range of wear. Those made from copper and lead smelter slags showed about the least wear of any sections, while that made from a very light (56 lb.) iron slag showed the greatest wear of all. The sections made from 75 lb. slag stood up with the average of other aggregates which the report rightly says "is interesting in view of the impression that slag is not suitable for concrete road construction under any circumstances."

The sand tests are important in that they develop the fact that the tensile strength test is not consistently reflected in the wear of the pavement. This, the report says, is probably due to the fact that factors that influence the tensile strength (gradation and quality of the sand grains) do not affect the surface wear to the same degree.

All the coarse aggregate test sections had the same Potomac river sand for fine aggregate. For the sand tests various river sands with different gradings, brought in from various parts of the United States, were used. Section No. 22, which showed the deepest wear, was a satisfactory concrete sand except that it contained considerable carbonaceous shale. Another section (No. 50) was made of Potomac river sand but was fine, only 9% remaining on 20 mesh. Practically all the other sands shown were coarse enough so that 30% or more remained on 20 mesh, as the highway specifications usually demand.

Finely crushed slag and limestone screenings were also tried as fine aggregate. Neither tested so well as the natural sands. The reason for this appears to be that with the grading of the material used in the test sections the concrete made from these aggregates was harsh and did not finish well. The report suggests the addition of fine sands to screenings, where this is necessary, in order to supply the lack of fines and prevent harshness.

Wisconsin's First Portland Cement Plant

Manitowoc Portland Cement Company—Pumping of Clay a Feature

By Charles A. Breskin

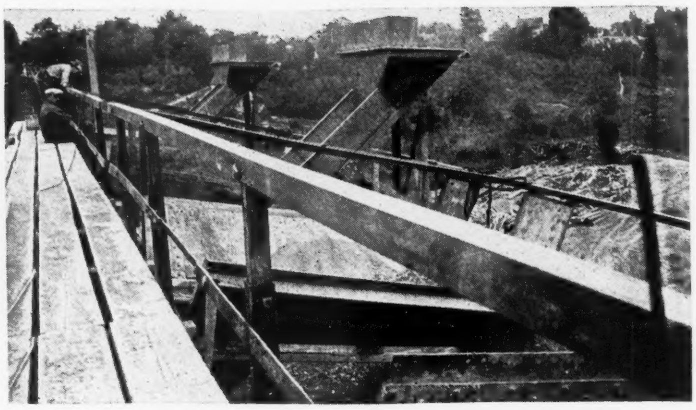
THE manufacture of portland cement requires a limestone practically free from magnesium carbonate and a shale or clay to make about 20% silica and 5% alumina in the mixture as a whole. Shale or clay suitable for cement manufacture is found in Wisconsin but a limestone with less than 5% magnesium carbonate has never been located. This is perhaps the only reason why Wisconsin has never had a cement plant, for from the standpoint of portland cement consumption Wisconsin ranks third in the United States, there being 1.68 bbl. consumed per capita population. The average consumption per capita in the United States is 1.06. Thus from a consumption standpoint Wisconsin could well afford to have a portland cement plant, and it is this that caused the establishment of the Manitowoc Portland Cement Co., even though it was necessary to use Michigan limestone.

The city of Manitowoc was chosen as a plant site because of its ideal harbor facilities and its location with respect to railroad shipments. Manitowoc being one of the gateways through which an enormous amount of east- and west-bound traffic flows via car ferry across Lake Michigan, an ample supply of cars is assured, since normally 40% of the cars westward are empty. This, together with the direct-rail service to points in Wisconsin and upper Michigan, will enable the new plant to serve its territory to the best possible advantage.

The first concrete for the new mill was poured on September 18, 1923. On May 19, 1924, the plant was in operation, and this is quite a record when one stops to consider that most of the construction went on during the severe Wisconsin winter months.

The plant site is located on the Manitowoc river about one mile from Lake Michigan, and practically in the heart of the city of Manitowoc. In order to admit lake freighters of the largest size to the dock of the plant it was necessary to dredge the river to a depth of 21 ft. In these lake carriers stone is brought over from Michigan and coal from other points. Gypsum is also obtained from Michigan, but most of it is brought over in regular gondola cars which are ferried across the lake. The remaining necessary ingredient, clay, is a local material which is obtained from a deposit that

Airplane view of Manitowoc Portland Cement Co., Manitowoc, Wis.



Left—The bridge crane distributing coal in the dock storage. The crane has a span of 234 ft. and a runway of 1000 ft. Right—Top of the stone bins showing hoppers which receive the stone from the bridge crane bucket elevator

is about one mile from the plant. As the lake carriers arrive at the plant dock they are unloaded by a Mead-Morrison bridge crane fitted with a 4½-yd. clam-shell bucket. The crane covers a span of 234 ft., has a runway of 1000 ft. and a capacity of 300 tons per hour. It piles material to a height of 51 ft. In the storage space on the dock there can be stored over 250,000 tons of stone and 75,000 tons of coal, which is enough to run the plant at full capacity of 3500 bbl. per day for one year—more than ample to tide over the period when navigation is closed on Lake Michigan and it is impossible to receive either limestone or coal.

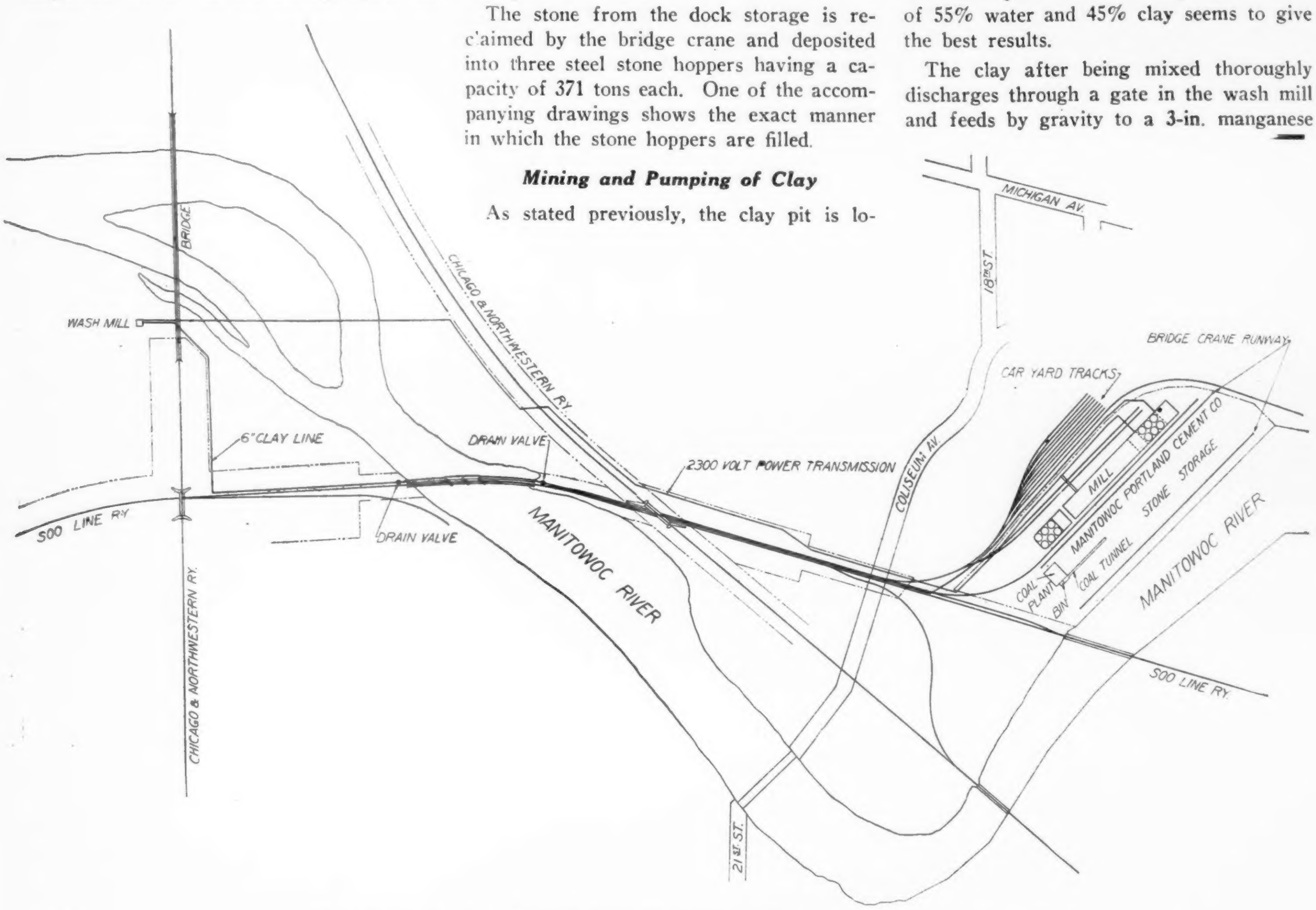
The limestone when it arrives at the plant is of a size suitable for raw grinding and so there is no initial crushing to be done. The stone is sized to 1¾-in. and finer with a good percentage of dust, which is ideal for "compeb" mill feed.

The stone from the dock storage is reclaimed by the bridge crane and deposited into three steel stone hoppers having a capacity of 371 tons each. One of the accompanying drawings shows the exact manner in which the stone hoppers are filled.

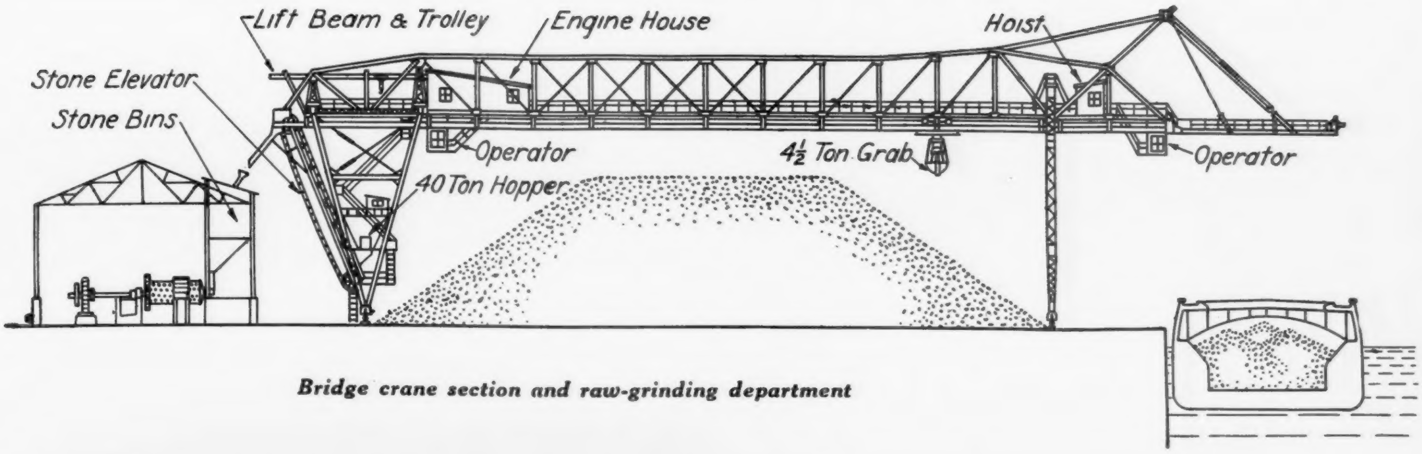
Mining and Pumping of Clay

As stated previously, the clay pit is located about one mile from the mill site. There is a 52-acre deposit here with practically no overburden to be stripped. The face of the clay bank is approximately 80 ft. in height. The clay is excavated by a ¾-yd. Thew electric shovel which deposits the material intő 1½-yd. rocker dump cars. A Fordson locomotive hauls the cars to the clay wash mill. The rocker dump cars discharge direct to a 26-ft. Allis-Chalmers wash mill, where the clay is mixed with water suitable for compeb mill feed. It is attempted here to put in a little less water than is required at the slurry. A mixture of 55% water and 45% clay seems to give the best results.

The clay after being mixed thoroughly discharges through a gate in the wash mill and feeds by gravity to a 3-in. manganese steel-lined Morris dredging pump. The gate in the wash mill prevents the mixture from discharging until it is ground to the proper consistency. The dredging pump pumps the clay through a 6-in. cast-iron underground pipe line about 5300 ft. long to the clay stor-

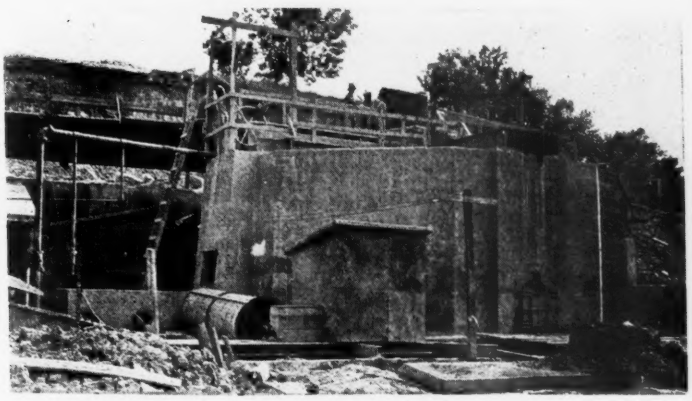


This shows the location of the mill, property lines, clay pit, pipe line, etc.

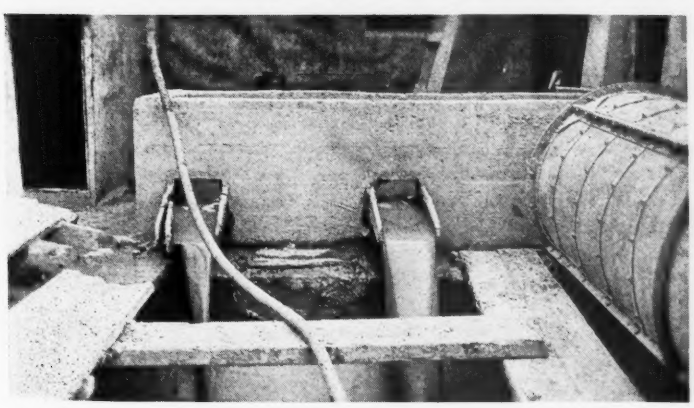


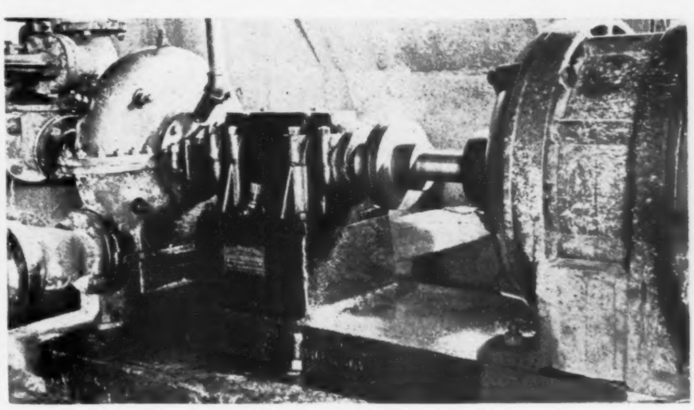
Bridge crane section and raw-grinding department

Bird's-eye view of the clay pit and wash mill. This is located along the Manitowoc river about one mile from the plant. Clay is excavated by an electric shovel and deposited into cars which are dumped directly into the 26-ft. wash mill

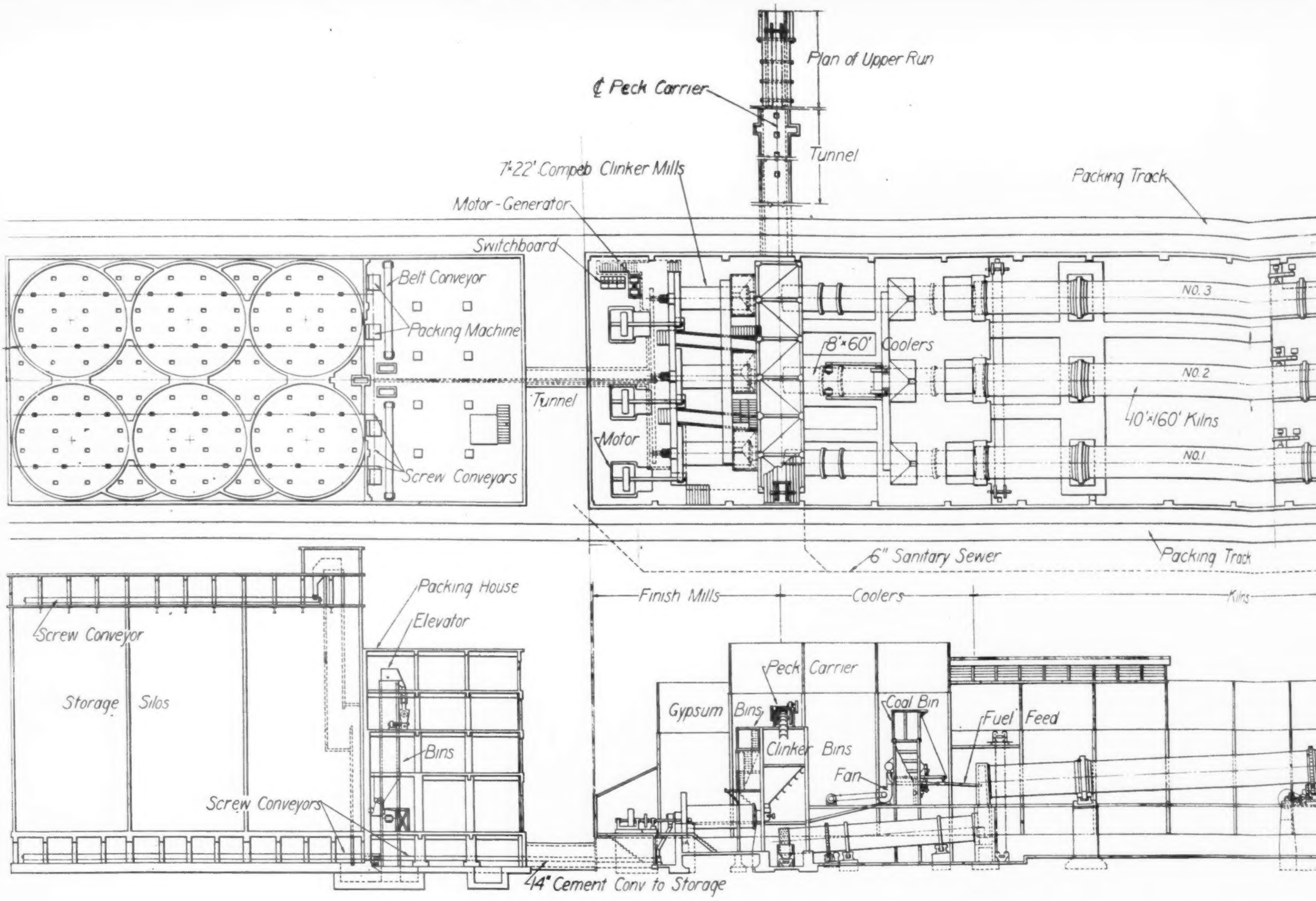


Left—The 26-ft. wash mill. It is made of concrete and has chain sweeps inside. Right—The discharge from the wash mill. The gate prevents the mixture from flowing out until it is ground to the proper consistency





Left—Clay mixture flowing by gravity to the dredging pump. The screen on the right is used where an excess of gravel is present in the clay. Right—This 3-in. manganese steel lined centrifugal pump delivers the clay to the raw-grinding department through a 6-in. pipe line over a distance of 5300 ft.



Plan and elevation of Manitowoc Portland Cement Co. plant at Manitowoc, Wis. The silo storage for finished cement

age tanks at the plant. The pipe line is located below the freezing line of the earth, as it will be necessary to operate the clay plant during the winter.

The dredging pump is driven by a 40-hp. motor. Immediately beyond the discharge end of the pump compressed air is introduced into the pipe line. This is done to lighten the load on the line. The effect of air at this point is to decrease the effective volume of the clay in the pipe line at any one time, thereby cutting down the fluid friction to be overcome. The action of the pipe line with air is quite similar to the action of an air-lift pump. Added benefit from the use of air is obtained by keeping the pipe line thoroughly clean at all times.

The clay mill is located along the Manitowoc river. Water for mixing with the clay is pumped directly out of the river. The mill is belt-driven from a 75-hp. three-bearing motor. Air for the pipe line is furnished from a Chicago Pneumatic air compressor with a capacity of 200 cu. ft. of air per minute. The clay is pumped into two clay storage tanks built of concrete, 31 ft. inside diameter and 34½ ft. deep. The combined capacity is sufficient for 12,500 bbl. of cement. From here it is pumped out by a 3-in. manganese steel Morris centrifugal pump to a small feed tank located over the two main storage tanks. The clay then feeds by gravity to the raw-grinding compeb mills. A duplicate pump is installed for emergency purposes.

Raw Grinding

In the raw grinding department there are three 7x22-ft. compeb mills, each driven by 400-hp., 2300-v., 60-cycle Allis-Chalmers synchronous motors through 60-in. Cutler-Hammer magnetic clutches. A 60-k.w. exciter set furnishes exciting current for synchronous motors and for operating magnetic clutches. The mills are located directly ahead of the stone bins.

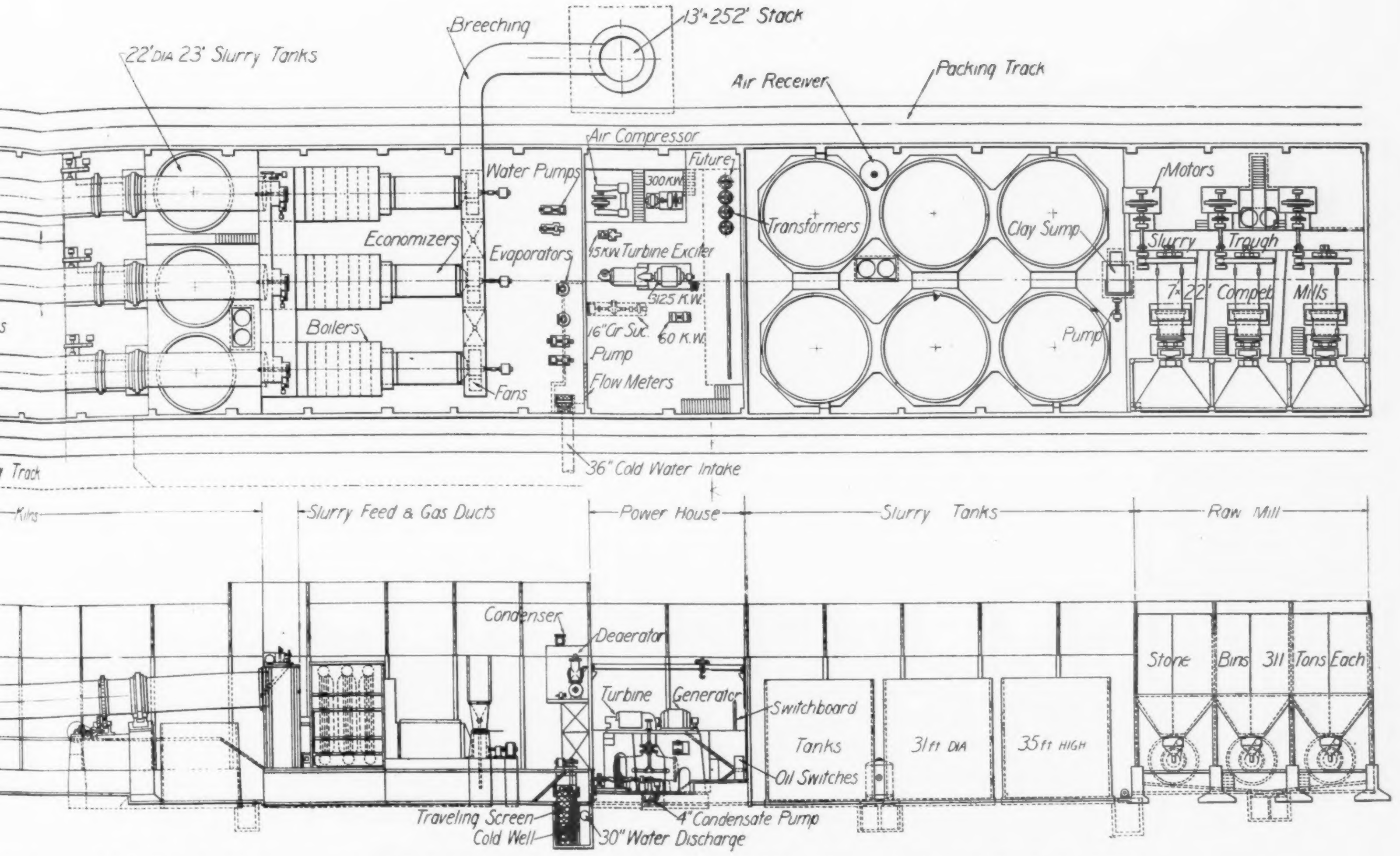
The discharge from the compeb mills flows through a common sump to an Allis-Chalmers slurry pump, by which it is forced into any one of four slurry tanks. These tanks adjoin the two clay tanks and are of exactly the same size and capacity. The tanks are all air agitated. Another slurry pump is located between the four slurry tanks and this makes it possible to pump from one tank into the other or for pumping from any one of the four tanks into the kiln feed tanks, of which there are three, one located under each kiln. These tanks are 22 ft. inside diameter and 23 ft. deep with a capacity for 1000 bbl. of cement each.

Another slurry pump takes the slurry out of the kiln feed tanks and delivers to the feed trough at the upper end of the kilns. The trough carries paddle agitators to keep the slurry in a uniform mix until fed into the kilns. The discharge into the kilns is accomplished by means of Ferris wheel bucket feeders, each driven independently by a two-speed squirrel-cage motor connected in parallel with a similar motor operating the kiln. By this arrangement the two work in harmony, so that when the kiln is down the feed is also down.

Burning and Cooling

There are three kilns, each 10 ft. in diameter by 160 ft. long. Each kiln is driven by a 50-hp. two-speed motor through a Link-Belt chain drive. The kilns were manufactured by the Manitowoc Engineering Works and are insulated with Sil-O-Cel with the exception of 35 ft. from the firing end and about 25 ft. from the feed end.

Clinker discharges directly from the kilns into three rotary coolers each 8x60 ft. The



...ished cement is being doubled now and when finished will contain over 300,000 bbl. (Copyright Rock Products, 1924)

coolers are lined with paving brick for the first 40 ft. and are operated by 20-hp. squirrel-cage induction motors. The clinker discharges from the coolers into a 24x24-in. Link-Belt Peck carrier running at a speed of 25 ft. per minute and is conveyed to storage or discharged into clinker bins ahead of the finish compeb mills. The Peck carrier runs outside the main building through a tunnel, and it is here that the only storage for clinker is provided. It is not the intention of the company to store any great amount of clinker, but to store a great amount of finished cement.

Finish Grinding

The clinker bins ahead of the finish compeb mills have a capacity of 1000 bbl. each and the clinker is drawn from them through 24-in. feeders to three compeb mills. These mills are of the same size as those in the raw end of the plant, 7x22 ft., and the motors operating them are of the same specifications. Gypsum is added at this point from a 30-ton bin located immediately in front of each compeb.

The cement discharged from the compeb mills is carried to a 14-in. conveyor carried in a tunnel running to the storage silos. At the base of the silos it is taken up by two elevators discharging at the top of the silos into a cross conveyor which delivers to two lateral screw conveyors running the length of the bins.

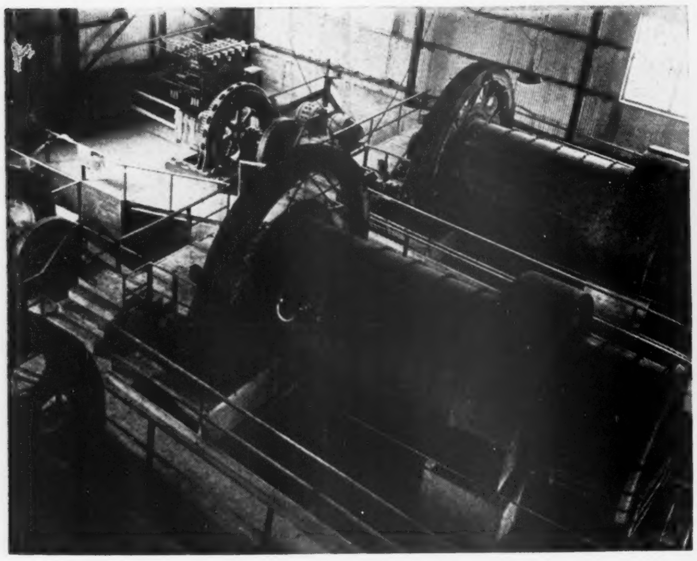
In connection with the operation of the finish compeb mills and the elevation and conveying of cement to the silos there has been installed an interlocking electrical arrangement between the magnetic clutches on the mills and the motors of the elevating and conveying machinery. This eliminates the danger of "plug-ups," so that if the elevators and conveyors go down, the compebs will also go down and the magnetic clutches on the compebs cannot be closed until the motor which went out is started again.

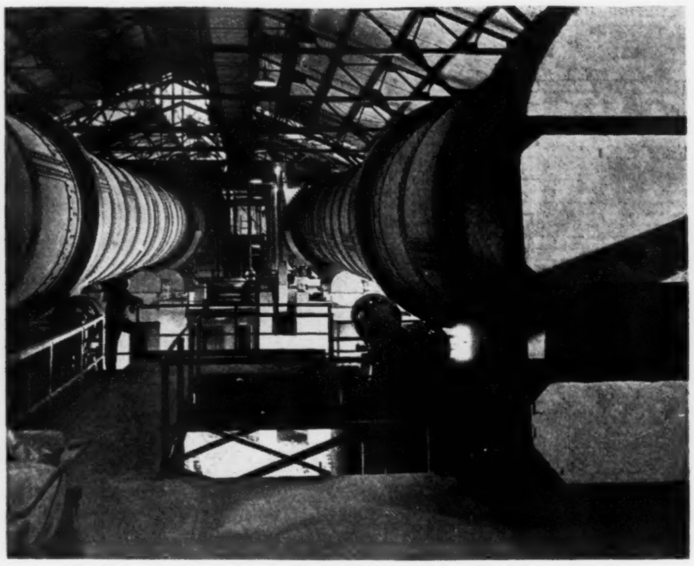
Silo Storage and Packinghouse

The silo storage consists of six bins, each 36 ft. inside diameter by 80 ft. deep, and taken together with the interspaces has a capacity of 154,000 bbl. At the time of the writer's visit to the plant (July) six additional silos were under construction and this will just double the storage capacity. This emphasizes what was brought out before in discussing clinker storage. The company would rather have greater finished cement storage than clinker storage.

Cement is drawn out of the silos into four longitudinal screw conveyors located underneath the silos and the packinghouse which adjoins the silo storage. The packinghouse is a building 50 ft. wide and 78 ft. long, having a basement and four floors above. The screw conveyors discharge to two elevators which carry the cement to the fourth floor of the packinghouse; and from here it is worked downward through distributing spouts and screens to the packing machine bins which are constructed of concrete and built in the second floor of the packinghouse. Immediately underneath on the first floor are located four 3-tube Bates valve-bag packers, two on each side of the building. The packing machines are on elevated platforms underneath which are 30-in. belt conveyors that deliver the sacked cement to the cars on both sides of the building. Freight cars are loaded on both sides of the plant while trucks and wagons are loaded on one side. Two Mead-Morrison electric car pullers are installed on both sides of the packinghouse.

The packinghouse has an electric freight elevator that operates between the basement and the fourth floor. Bags are delivered here and stored. On the upper three floors





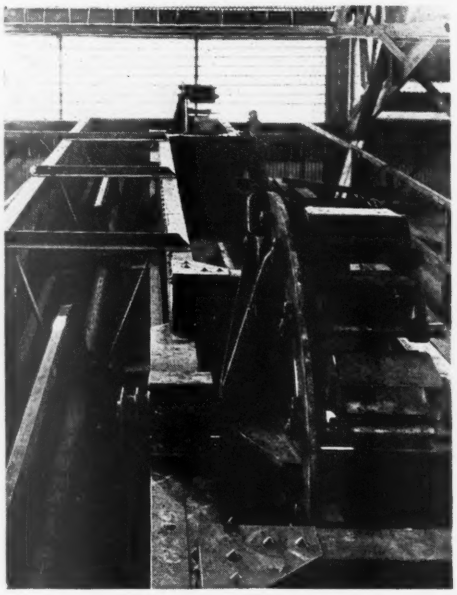
Left—The raw-grinding department. There are three compeb mills each 7x22 ft. and each being driven by a 400-hp. synchronous motor through a 60-in. magnetic clutch. Right—There are three kilns, each 10x160 ft., driven by a 50-hp. variable-speed motor

of the packinghouse the cleaning, selecting and repairing of bags goes on as well as the storage. Bags from any upper floor are delivered to the lower floor by means of steel chutes. All the doors and sash are of steel construction. Arrangements have also been made to load cement in bulk. The silo storage and packinghouse were constructed by the Macdonald Engineering Co.

At the time of the writer's visit an order had been placed for a Sly dust-collecting system to be placed in the packinghouse in connection with the bagging machines. The purpose of this is to save the cement that is lost during the bagging process and to eliminate as much of the dust as is possible.

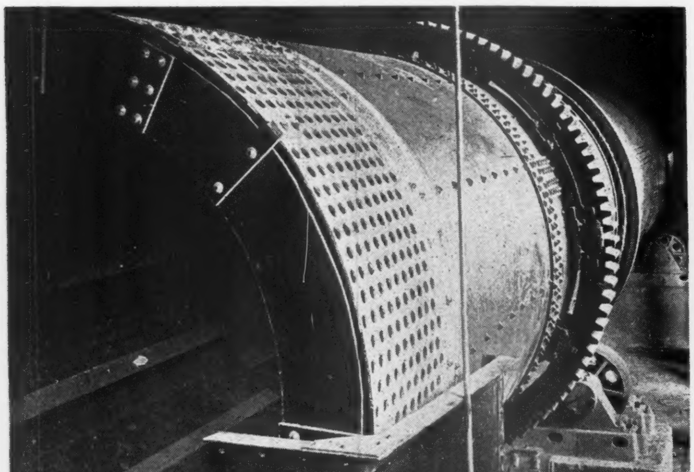
Coal Plant

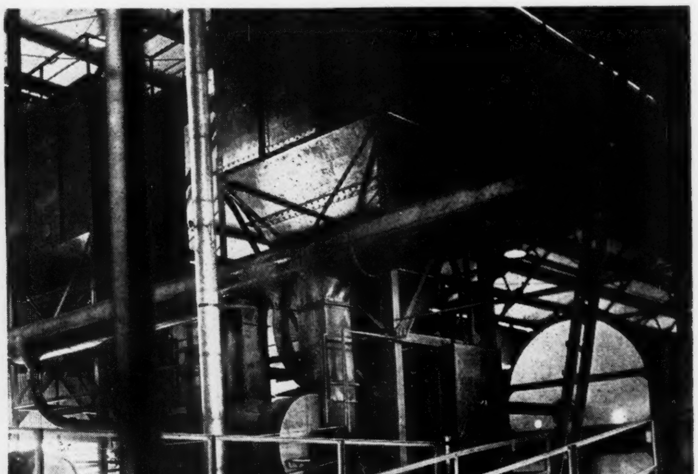
Coal is brought in by boat and unloaded on the dock in the same manner as the limestone. Underneath the coal storage and extending 225 ft. from the coal plant is a concrete tunnel in which there is located a 30-in. belt conveyor. Coal is deposited on this belt conveyor through feeders in the tunnel. It is then carried through a Merrick weightometer to a Pennsylvania roll crusher. The head pulley of the weighing conveyor is fitted with a Magnetic Manufacturing Co. magnetic pulley to catch all tramp iron before it gets into the crusher. In the event that coal screenings are handled the conveyor is so arranged that the crusher can be by-passed and coal discharged directly to the elevator that carries it up to the bin ahead of the dryer.



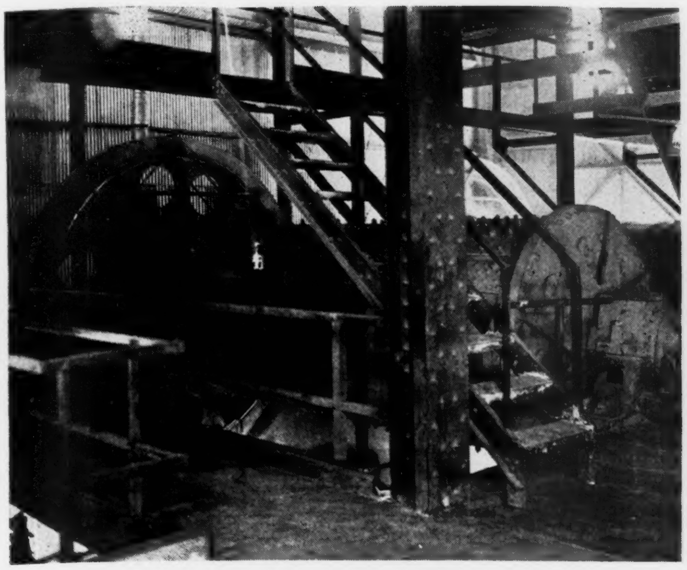
Feed trough with paddle agitator at the upper end of the kilns. The Ferris wheel bucket feeder discharges the slurry into the kilns

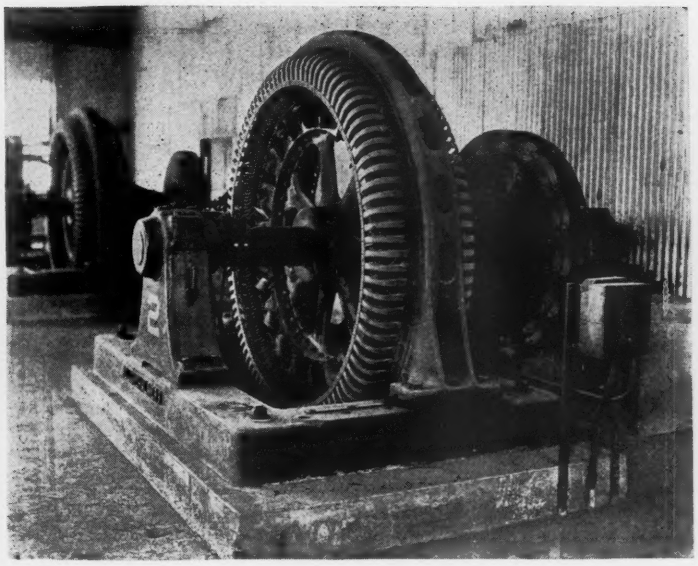
The coal from the crusher is elevated to the moist coal bin which has a capacity of 120 tons or enough to keep the plant running for 12 hours. From the moist coal bin the coal goes direct to a 6x60-ft. hand-fired natural-draft dryer. The dryer has four compartments and was built by the Manitowoc Engineering Works. The discharge from the coal dryer is elevated into a set of three steel bins located over three 42-in. Fuller-Lehigh mills. The bins have a combined capacity of 100 tons. The Fuller-Lehigh mills have vertical pulley drives and are belt-driven from 75-hp. vertical motors.



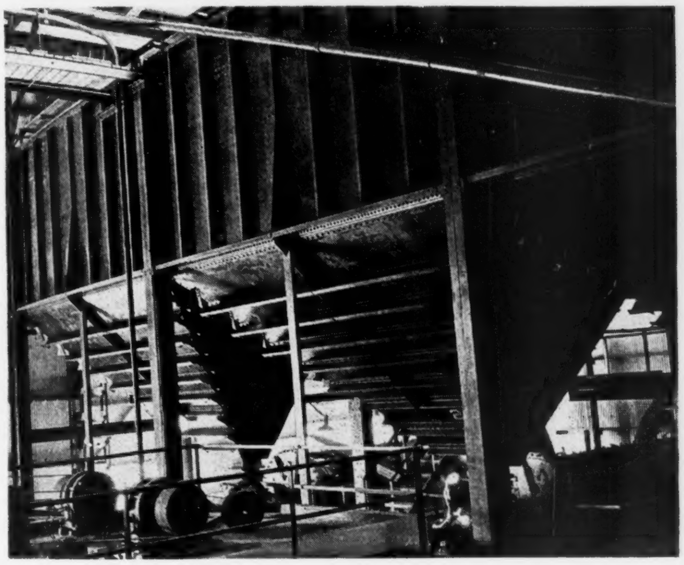


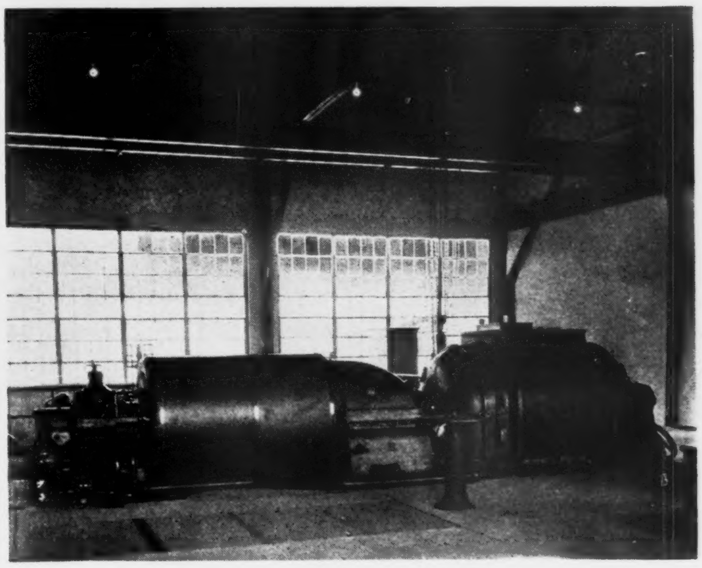
Left—The coolers are 8x60 ft. They are lined with paving brick for the first 40 ft. and discharge into a Peck carrier immediately below it. Right—Pulverized-coal bins in the burning room. The fans in the foreground discharge into a common header extending the width of the room and there is a discharge from the header to each kiln. One fan is held in reserve for emergency purposes



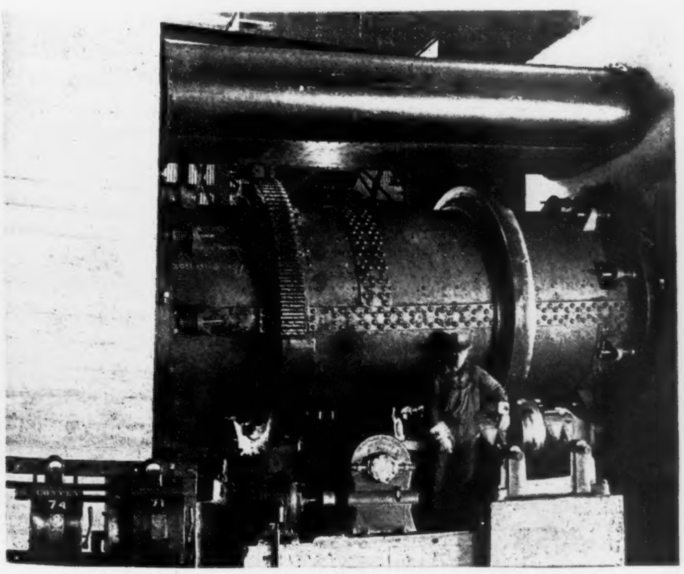


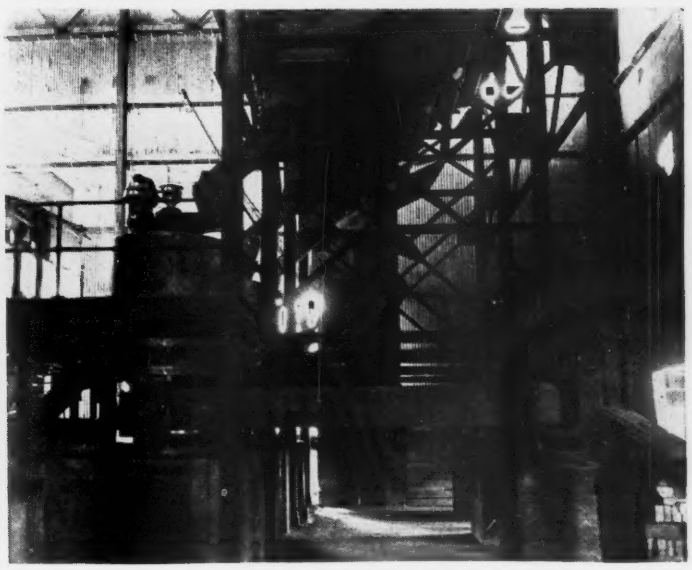
Left—The finish-grinding compeb mills are also 7x22 ft.—an exact duplication of the raw-grinding compebs. Right—One of the 400-hp. 2300-v. synchronous motors with 60-in. magnetic clutch



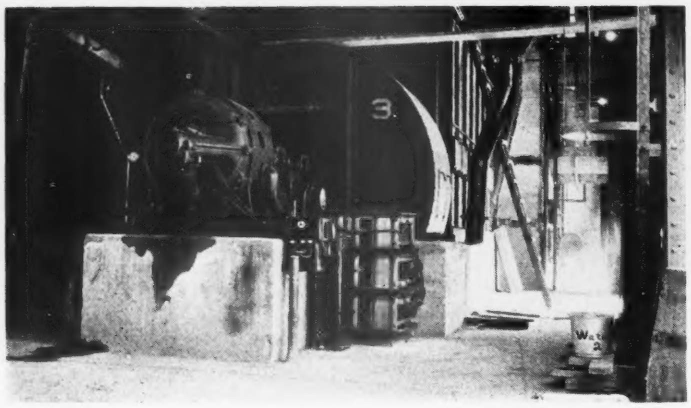


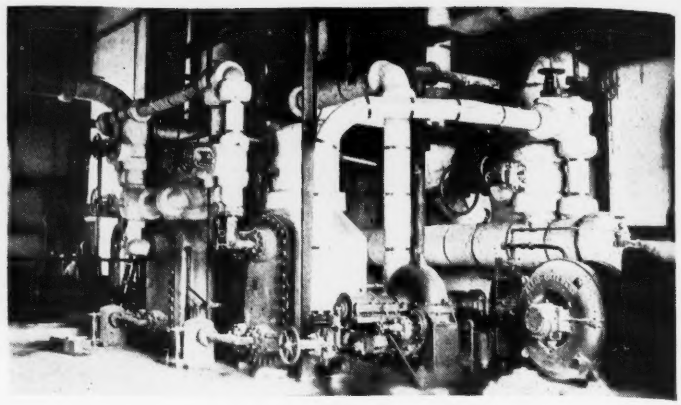
Left—The clinker bins ahead of the finish-grinding compeb mills. Note details of construction. Right—A 3125-k.v.a. turbo generator is located in the turbine room. This generates more than the power requirements of the plant by the utilization of waste heat gases from the kilns



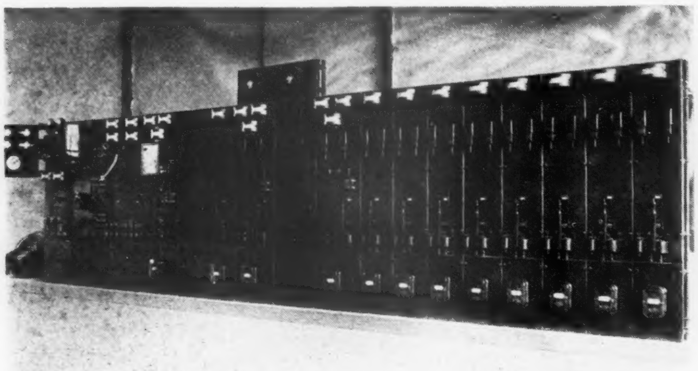


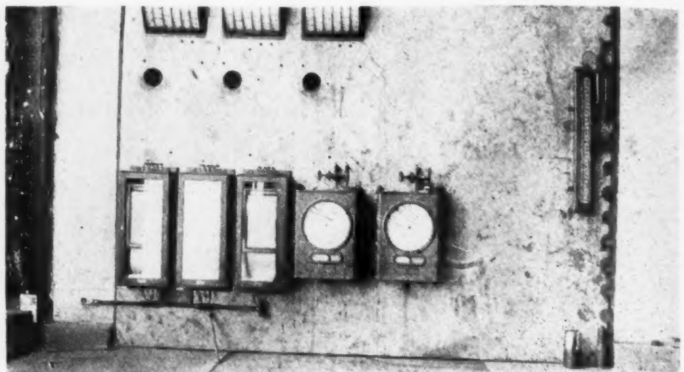
Left—A 6x60-ft. hand-fired natural draft dryer is located in the coal mill. It has four compartments. Right—The pulverizing unit in the coal mill. The mills have vertical drives and are driven from 75-hp. vertical motors





Left—The induced draft fans, economizers and waste heat boilers. Each kiln has one of these units. Right—The evaporating plant consists of two evaporators, a condenser and a de-aerator





Left—The main switchboard in the turbine room. There is a panel with controls for every department. Right—The instrument board contains pyrometers, fluid meters, draft gages, etc. It was not completed when this photograph was taken

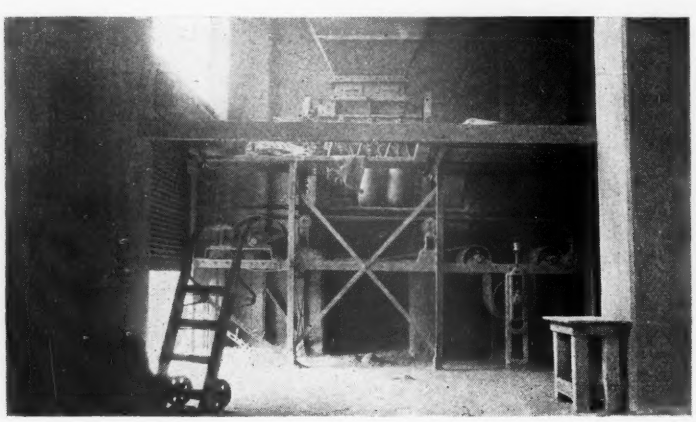
The pulverized coal from the Fuller mills discharges into a common screw conveyor leading to a Fuller-Kinyon coal pump which delivers the pulverized coal to the coal dust tanks in the burning room. There is a tank ahead of each kiln and each one has a capacity of 28 tons. The pulverized coal is drawn out of these tanks by screw feeders and fed to the kilns through a burner of the company's own design. Two Bayley fans have been installed, each of which discharges into a common header extending the width of the kiln room, with a discharge from the header to each kiln. One of these fans is of ample size to supply the kilns and so the additional fan is held in reserve for emergency purposes.

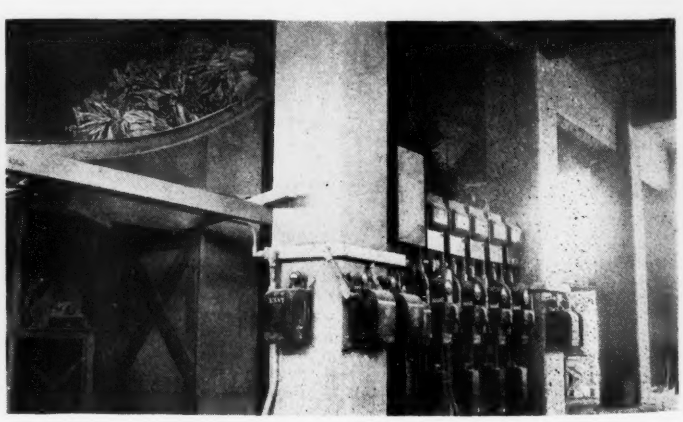
Arrangements in the coal plant are not yet complete, but before long it is hoped to install a dust-collecting system in connection with the dryer discharge and the Fuller mill vents.

Waste Heat Utilized

The waste heat boilers and the power plant are in the main building in line with the rest of machinery. In fact, the power plant is located between the kilns and the raw grinding department. This is a departure from orthodox cement plant design, but was necessary in order to take advantage of the company's property.

Each of the three kilns discharges its gases into a six-drum, 750-hp., three-pass Rust waste heat boiler fitted with B. & W. superheater, B. F. Sturtevant economizer and B. F. Sturtevant induced draft fan. Each fan is driven by a 100-hp. variable-speed motor. In this arrangement for the utilization of waste heat the plan of having one boiler for each kiln was adopted and not the practice of having one common flue for all the waste gases. The gases from all three fans are discharged into one common flue leading outdoors to a 13x250-ft. concrete stack. The foundations for the boilers, economizers and the





Left—The packing machine and conveyor underneath. There are four machines, two on each side of the plant. Right—Controls on the first floor of the packinghouse. Note the steel chute which delivers bags to the packing machines from the upper floor

common flue are all hoppered for the removal of flue dust. Equipment is now under construction that will recover this flue dust and feed it back to the kilns with the slurry.

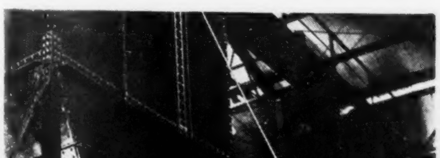
The turbine room is located back of the boilers and is separated from the rest of the mill building by plastered walls. The generating equipment consists of one Allis-Chalmers 3125-k.v.a. 2300-v. 60-cycle turbo generator. The turbo generator is operated with a surface condenser. Power generated at 2300 v. is used at this voltage in the synchronous motors driving the compeb mills. For use in induction motors in the balance of the plant it is transformed to 440 v.

A 60-k.w. generator set provides the exciting current for the main generator.

The main switchboard located in the turbine room has panels for control of each department in the plant. There is also a 300-k.w. motor generator set for generating the direct-current that operates the bridge crane. An 18x14-in. Ingersoll-Rand air compressor supplies all the air necessary for slurry agitation and for operation of the slurry pumps.

In one side of the turbine room is an instrument board with three Brown duplex recording pyrometers for recording the temperatures of the gases entering and leaving the waste-heat boilers. In connection with each waste-heat boiler is a Bailey fluid meter for recording the steam flow and steam temperatures from the waste heat boilers. One Bailey meter is provided for recording the flow of steam to the turbine and another for recording the flow of feed water and temperature of same entering and leaving the feed water heater. Brown indicating pyrometers have been placed in the boiler room for indicating the temperatures in all passes of the boilers.

In the boiler plant is an evaporator plant consisting of two No. 24 Reilly evaporators, a condenser and a de-aerator. All of this equipment was furnished by the Griscom-Russell Co.



Pulverized-coal bins and feeders. Coal is delivered to the burning room from the coal mill by a Fuller-Kinyon pump

Under normal operating conditions the quantity of steam generated in the waste-heat boilers is somewhat in excess of the power requirements of the plant and this excess is used for operating the evaporating plant. The balance is wasted through safety valves. The evaporators in addition to supplying pure water for the boiler makeup use a quantity of live steam which would otherwise be wasted, thereby cutting in half the quantity of makeup otherwise necessary.

No auxiliary boilers have been provided in this plant, as there are connections with outside current, and this makes it possible to start up and keep the plant going in case the boilers should go out.

The trademark of the Manitowoc Portland Cement Co.

Special Features

In the design of the plant the endeavor was to eliminate chains and sprockets wherever possible, and Cleveland worm gears have been installed in every case where the construction would admit of such units.

The kilns and coolers were manufactured by the Manitowoc Engineering Works, a department of the Manitowoc Ship Building Corporation, Manitowoc, Wis. All of the steel fabrication and erection was done by the same company. All of the main buildings are covered with Armco ingot iron roofing and siding. Bucket elevators and screw conveyors were furnished by the H. W. Caldwell Co., belt conveyors by the Stephens-Adamson Manufacturing Co. and all motors by the Allis-Chalmers Manufacturing Co.

The trademark of the new company is "Badger State Portland Cement." The design is shown by one of the accompanying photographs.

The following is a test of all Manitowoc cement shipped to the Wisconsin Highway Commission during June and July. The cement tests about 60% better than the standard requirements on 7-day tensile strength:

—Time of Setting—		Fineness	—Tensile Strength— Lb. per sq. in. 1:3 Sand Briquettes	
Initial Hr. Min.	Final Hr. Min.	200 Mesh Sieve	3 d.	7 d.
3—39	7—34	83.18	226	322

Two electric car pullers are located at the packinghouse. Empty cars are pulled up while the loaded cars are gravitated down the track

Officers of the Company

The Manitowoc Portland Cement Co. is a Wisconsin corporation of which Charles C. West is president. Mr. West is also president of the Manitowoc Shipbuilding Corp. and the Manitowoc Engineering Works. J. B. John is vice-president and general manager. Mr. John needs no introduction to the cement industry. He is president of the Sandusky Cement Co. and vice-president of the Petoskey and Newago Portland Cement companies.

In the design and construction of the plant Mr. John had a very considerable hand. In fact, it incorporates all the best ideas gained by him in the construction of the new Sandusky Cement Co.'s plant at Silica, Ohio, and the Petoskey plant. L. E. Geer is secretary and treasurer; H. Vanderwerp, assistant general manager and in direct charge of the plant; J. E. Thiell, assistant treasurer; F. E. Town, superintendent, and E. B. Nickles, engineer. P. G. Dawson is assistant secretary. H. A. Meyer is purchasing agent. The general offices are located in Manitowoc, Wis. The plant is served by four railroads—the Chicago and Northwestern, Pere Marquette, Soo Line, and Ann Arbor.

New Illinois Agstone Plant

OLNEY and Calhoun business men have become interested in a project that may mean much to the farmers of Richland county, Ill. It is proposed to install a limestone crushing plant at the Calhoun Coal Co.'s mine and grind the fine quality of limestone found there for agricultural purposes.

One of the parties interested in the new venture informed the writer that the company expects to furnish the ground limestone to farmers at the plant, which is 2½ miles east of Calhoun, at $1.50 per ton.—*Olney Times.*

Hardening Process of Lime Mortars

Chemistry of the Addition of Aluminates to Lime to Give Mortars Quick-Setting and Hydraulic Properties

By J. E. Duchez, Engineer

Authorized Translation from the French Mines, Carrieres, Grandes Enterprises by C. S. Darling

OUR patent of February 21, 1923, previous to the publication of the article of the Schaffer Alles Chemical Co. on the subject of their product "Piercite" (ROCK PRODUCTS, April 7, 1923) has been taken as fixing a date for the theory of setting and the part played by the aluminates of lime in hydraulic cementing materials. Our text published in November, 1922, and referring to several plants in 1920-1921 on the subject of "ciment fondu" or fused cement, proves that already our theory had received considerable publicity previous to February, 1923.

We know nothing of the chemical composition of "Piercite" but the theory below shows that it hardly can be a question of anything else but aluminates less basic than Al_2O_33CaO or hydrated alumina $Al_2O_33H_2O$.

The article in ROCK PRODUCTS on "Piercite" seems to concern itself only with pure or industrially pure lime while our studies include all limes and hydraulic cementing materials of a general nature.

In principle the bodies in contact or the elements of the chemical composition of a hydraulic cementing material are:

$$\text{Silica} + \text{Alumina} + \text{Lime}$$

with the inevitable impurities

$$\text{Iron} + \text{Magnesia} + \text{Sulphuric Acid}$$

occurring with the raw materials, but always in quantities sufficiently small to make it possible to consider the iron as alumina and the magnesia as lime, and the sulphuric acid so weak that it does not affect the value of the cementing material.

Therefore, in principle, we can summarize the constituents of a hydraulic cementing material as three:

$$\text{Silicate of Lime} + \text{Aluminate of Lime} + \text{Lime}$$

The molecular chemical composition before burning is therefore of the form:

$$x SiO_2 + y Al_2O_3 + n CaO$$

If x and y approach zero we have pure or industrially pure CaO, the quantities of silicates and aluminates formed during the burning being none or almost none. These limes set according to the following reaction:

$$CaO + H_2O = Ca(OH)_2$$

giving hydrate of calcium which crystallizes in the hexagonal system.

If the values of x and y increase, the lime becomes hydraulic, for it forms silicates and aluminates of lime which modify the system of crystallization of the whole.

We have published from November, 1922, to March, 1923, studies on the constitution and burning of artificial portland cement in which we have treated silicates and aluminates of lime capable of formation according to the temperature, the time of burning, and the physical texture of the raw materials. I shall not return to that subject. Our conclusions were that silicates of interest could be formed only between the limits SiO_22CaO and SiO_23CaO, and aluminates within the limits Al_2O_3CaO and Al_2O_33CaO. We have indicated that in the presence of an excess of lime, the conditions of burning were always fulfilled for the formation of Al_2O_33CaO.

We can therefore say that the formula of constitution of the hydraulic lime varies within the limits:

$$x(SiO_22CaO)+y(Al_2O_33CaO) + [n-(2x+3y)]CaO$$

$$x(SiO_23CaO)+y(Al_2O_33CaO) + [n-3(x+y)]CaO$$

If the values of n approach $3(x+y)$, the quantity of free lime remaining in the burned product approaches zero and the formulas approach:

$$x(SiO_23CaO)+y(Al_2O_33CaO)$$

the formulas of Le Chatelier;

$$x(SiO_22.5CaO)+y(Al_2O_33CaO)$$

the formula of Hendrickx;

$$x(SiO_22CaO)+y(Al_2O_33CaO)$$

a formula which we have recommended.

We therefore have to deal with cements and if the values of $(x+y)$ still increase we enter the range of limes which lose rapidly their hydraulic qualities when n approaches $3x$ or $3y$.

It is without question that the cements in which n approaches $3(x+y)$ are stronger than the hydraulic limes in which the value of n increases or diminishes. This indicates with certainty that the cohesion and adhesion of the crystallization increase for the maximum contents of silicates and aluminates of lime, and the minimum content of calcium hydroxide.

Now we have indicated in our study on the constitution and the burning of artificial portland cement, in the paragraph "Study of Calcic Silicates" and in the paragraph "Study of the Calcic Aluminates" that the crystallization of the silicates of lime occurs in lamella and that of the aluminates of lime in fine needles which are thoroughly mingled. We have concluded from this that there was a relation:

$$\text{Silicates} + \text{Aluminates}$$

which must give the mixture of lamella and the needles which presents the maximum adhesion and cohesion and consequently the maximum strength of the hydraulic cementing material.

The large crystals of hydrate of lime by their hexagonal form and the surfaces of contact presented, decrease the strength by hindering the mingling of the crystals with the needles or with the lamella of the aluminates and of the silicates of lime.

Therefore, if in a hydraulic cementing material the hexagonal crystallization is reduced while the lamella or needle crystallization is increased, the adhesion and the cohesion is increased, and consequently its initial strength, if not its final strength.

Now we have indicated in the study of the silicates of lime that only the silicates included between SiO_22CaO and SiO_23CaO were capable of setting and that they hydrated forming hydrated monocalcic silicates:

$$SiO_22CaO+3.5H_2O = (SiO_2CaO2.5H_2O)+Ca(OH)_2$$

$$SiO_23CaO+4.5H_2O = (SiO_2CaO2.5H_2O)+2Ca(OH)_2$$

liberating calcium hydroxide.

The set of the aluminates of lime is different. The only aluminate of lime which can form in the presence of water is the hydrated tricalcic aluminate $Al_2O_33CaO12H_2O$. There will, therefore, be according to the basicity of the aluminate of lime contained in the hydraulic cementing material in setting, the formation of hydrated tricalcic aluminate, and the liberation of a certain quantity of alumina hydrate $Al_2O_33H_2O$.

$$Al_2O_3CaO+6H_2O = \tfrac{1}{3}(Al_2O_33CaO12H_2O+\tfrac{2}{3}(Al_2O_33H_2O)$$

$$Al_2O_32CaO+9H_2O = \tfrac{2}{3}(Al_2O_33CaO12H_2O)+\tfrac{1}{3}(Al_2O_33H_2O)$$

$$Al_2O_33CaO+12H_2O=(Al_2O_33CaO12H_2O)$$

and we have indicated in the paragraph "Studies of the Calcic Aluminates" that the hydrated alumina liberated in the hydration of aluminates of lime less basic than 3CaO was capable of reacting with the free hydrated lime already contained in the cementing material, or liberated in the hydration of the silicates of lime which enter the composition of this material:

$$Al_2O_33H_2O+3Ca(OH)_2+6H_2O$$
$$=Al_2O_33CaO12H_2O$$

in order to form the hydrated tricalcic aluminate.

It is therefore easy to conclude:

Pure lime hydrates in the form

$$CaO+H_2O=Ca(OH)_2$$

and gives products of no great strength, with hexagonal crystallization. If we add to this lime a silicate of lime the crystallization will occur as follows:

$$SiO_22CaO+CaO+4.5H_2O$$
$$=(SiO_2CaO2.5H_2O)+2CaO(OH)_2$$

that is to say, it will give a lamellar crystallization corresponding to the silicate and an increase in the hexagonal crystallization since the quantity of calcium hydrate is increased by that of the hydroxide of lime liberated in the hydration of the silicates. There will be perhaps a slight increase in the strength through the presence of the lamellar crystallization, but the setting will remain slow, the setting of the $Ca(OH)_2$ not having been modified.

If we add an aluminate less basic than 3CaO to pure hydrated lime, the reaction will take place and form

$$Al_2O_3+2CaO+12H_2O=(Al_2O_33CaO12H_2O)$$

that is to say, with a decrease of the free hydrated lime and consequently of the hexagonal crystallization in favor of the needle crystallization. There will be more cohesion and adhesion in the crystallization of the material in setting, and consequently greater strength.

The additions made to the hydraulic cementing materials give the same results. But an increase in the rapidity of setting is noted rather than an increase in strength.

We know that different authors have pretended that these additions were not to be recommended. They have never given a reason for this statement. Our practical experiences are strongly conclusive in favor of the additions and we have obtained in this manner excellent white cements, hydraulic lime, either heavy or light, with a set more or less rapid at will, from quick-setting cements to "ciments de grappier" by changing the time of set, whereas they were unmarketable without the addition.

Besides, are the constituents in the product to which additions have been made different from those of the best hydraulic cementing materials in use? No, they remain absolutely the same. Nothing indicates that any disappointment need be feared since there is produced in their setting no phenomenon different from those which differentiate the setting of a slow cement from that of a quick setting cement.

Plan Weather Tests of Wire Screens

TESTS to determine the relative resistance to atmospheric corrosion of wire screens of different metals are planned by the Bureau of Standards of the Department of Commerce in co-operation with the American Society for Testing Materials. The metals to be included in the test are copper, commercial bronze, low brass, aluminum bronze, silicon bronze and Ambrac metal. All materials will be tested in the form of Standard No. 16 mesh screens.

The screens will be exposed to the weather in four locations: an inland location, an industrial center, a seacoast and a tropical seacoast. The cloth of each material will be exposed on a painted frame that will withstand the weather. Three types of frame will be used—12x12-in. wooden frames, 30x36-in. wooden frames and 30x36-in. metal frames. The tests will be made in co-operation with the manufacturers of the materials. The Bureau of Mines, the Bureau of Lighthouses and the Panama Canal will co-operate with the Bureau of Standards.

Control of Idleness in Industry*

By W. L. Conrad

Consulting Engineer, New York City

IT has long been the custom of industrial concerns to charge to the product all of the expenses incurred while that article or product was being manufactured. It requires no experience in bookkeeping to show the fallacy of such an arrangement. Any one at all familiar with economics in any form or with common business principles will fully realize that there are two legitimate operating-expense items:

1. An expense incurred which might be termed the "ownership expense" of the plant, and only its proportionate part of this expense can be charged to the product; this ownership expense, as the name implies, represents the expense incurred in owning a fully equipped plant ready for practical operation.

2. Actual operating expense.

It is obvious that owning a plant involves a certain fixed daily expense, even when the plant is not operating. Careful consideration of the expense incurred while the plant is idle frequently leads to valuable and interesting information. This applies not only to the plant and equipment as a whole, but to its different departments; for it usually is found that, when an honest effort is made to determine the actual reason for the idleness, there is a concentrated attempt to eliminate the causes of idleness. These causes generally are found to be within the plant itself, either in equipment or management.

Consideration of the causes of idleness of plant and equipment of many industrial establishments in the past has given us a general view of the question of production costs. This leads to a simplification of the problem that is worthy of careful consideration. A basic factor which might be brought out by such a consideration is that the cost of owning and maintaining a plant in idleness, where such a plant is properly equipped for efficient operation, will be substantially the same in any part of the country where the equipment can be bought at substantially the same price. This also apparently is true with many other factors that enter into the cost of idleness. Hence a standardization of cost methods which some years ago had been thought impossible is now almost an established fact, and the item "expense of idleness" is one of the important items.

*Extract from a paper before the American Society of Mechanical Engineers.

Increased Use of Phosphate on Missouri Farms

THE use of phosphatic fertilizers in Missouri is increasing very rapidly, according to a report recently made public by the Missouri College of Agriculture. The report shows that during 1923, the farmers of Missouri used 16,423 tons of acid phosphate. This amount was about 45% of all the fertilizer used in the state. The rapid increase in the use of this material has not been due entirely to the fact that it is the cheapest fertilizer on the market. Those who have used it have been well satisfied with the results obtained.

The wheat yield has been increased and the clover crop improved. Quite frequently, farmers say that the yield has been nearly doubled. Experiment stations have shown an average increase of 5.8 bu. of wheat per acre and 1222 lb. of hay on the following clover crop from an application of 175 lb. of 16% acid phosphate.—*Jefferson City (Mo.) Times.*

Abrasive Materials in 1923

THE production of natural abrasive materials in 1923 was much larger than in 1922, according to a statement issued by the Department of the Interior, prepared in the Geological Survey. The total quantity produced was about 250,000 tons, valued at more than $4,000,000. In addition there was produced in 1923 more than 80,000 tons of artificial abrasives, valued at $8,778,000.

The following table shows for each variety of natural abrasive an increase in quantity and value in 1923 as compared with 1922.

NATURAL ABRASIVES, PRODUCED IN THE UNITED STATES, SOLD IN 1922 AND 1923

	1922		1923	
	Short tons	Value	Short tons	Value
Millstones	(*)	$ 20,853	(*)	$ 22,229
Grindstones and Pulpstones	26,524	1,020,186	46,570	1,689,315
Oilstones, Scythestones, etc.	1,016	197,450	1,223	231,812
Emery	1,468	17,511	2 286	29,478
Garnet	7,054	566,879	9,006	688,437
Diatomaceous Earth and Tripoli	74,966	703,397	92,915	1,082,163
Pumice	45,262	175,600	56 575	214,169
Grinding Pebbles, etc.	3,159	30,798	4,551	51,795
	....	$2,732,674	....	$4,009.398

*Quantity not reported.

Ships a Solid Trainload of "Agstone"

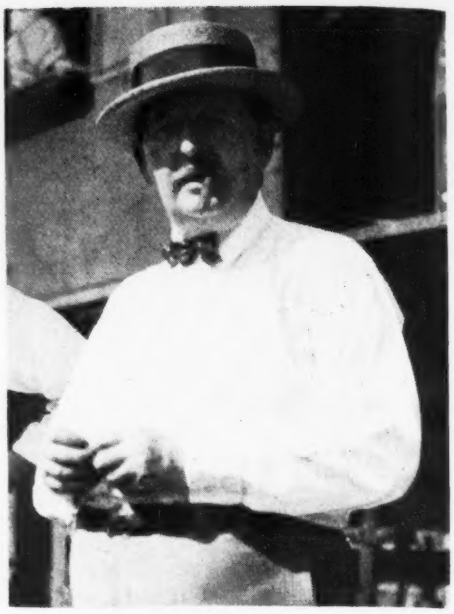
IN the August 23 issue of ROCK PRODUCTS mention was made of an arrangement between the county farm bureaus of Illinois and the larger limestone quarries of the state by which the plan of the Ilinois Agricultural Association for the purchase of agricultural limestone was adopted. In effect this plan gives farmers a wholesale rate on "agstone" by ordering co-operatively through the farm bureaus.

The results of this agreement have been shown in the way orders for "agstone" have been coming in and a very convincing proof of its success was the shipment of a solid train loaded with agricultural limestone which left the McCook plant of the Consumers Co., Chicago, on August 29, for Piatt county. It arrived in Monticello, the county seat, on August 30 and was broken up, the cars being routed to various parts of the county according to orders received from farmers. S. S. Davis, the county agent of Piatt county, was in charge of the distribution.

J. J. Sullivan, who has charge of "agstone" sales for the Consumers Co., was perhaps the first salesman in Illinois to sell limestone through county agents and farm bureaus. In the early part of the century when the use of agricultural limestone was beginning to be advocated, he visited every county in the state, trying to interest dealers in handling this product. He met with no success whatever. At that time Illinois had only four county agents. One of these had been thoroughly "sold" on the value of agricultual limestone and he helped Mr. Sullivan in making direct sales to farmers. After this start was obtained the dealers fell in line and the agricultural limestone business was established.

Not all the "agstone" shipped from the plant goes out on the railroad. The farmers in the vicinity and even at considerable distances are buying it by truckload, the Consumers Co. in many cases making the deliveries. Trucks are loaded by a Northwest Eng. Co. crane with gasoline engine.

The McCook plant of the Consumers Co. is in Lyons township about 14 miles west and south of the Chicago "loop." It is one of the important quarry operations near Chicago, producing flux stone and commercial crushed stone as well as agricultural limestone. The plant is of especial interest from the fact that Edison giant rolls are held as a primary crusher. F. W. Grear is superintendent.



J. J. Sullivan, who has charge of agricultural limestone sales for the Consumers Co.

A solid trainload of agricultural limestone shipped from the McCook plant of the Consumers Co. to Piatt county, Illinois

McCook plant of Consumers Co.

Loading "agstone" for truck delivery

Editorial Comment

Sand at 30c per Ton

We are reliably informed that a "peculiar" condition exists in a certain Mid-West locality. "Today practically all quotations on sand are made at a price of 50c per ton, but there is verry little sand being sold for more than 30c per ton. It seems customary to quote a contractor 50c and then when it comes time for him to place the order to charge 30c." Needless to say business in this locality is pretty dull.

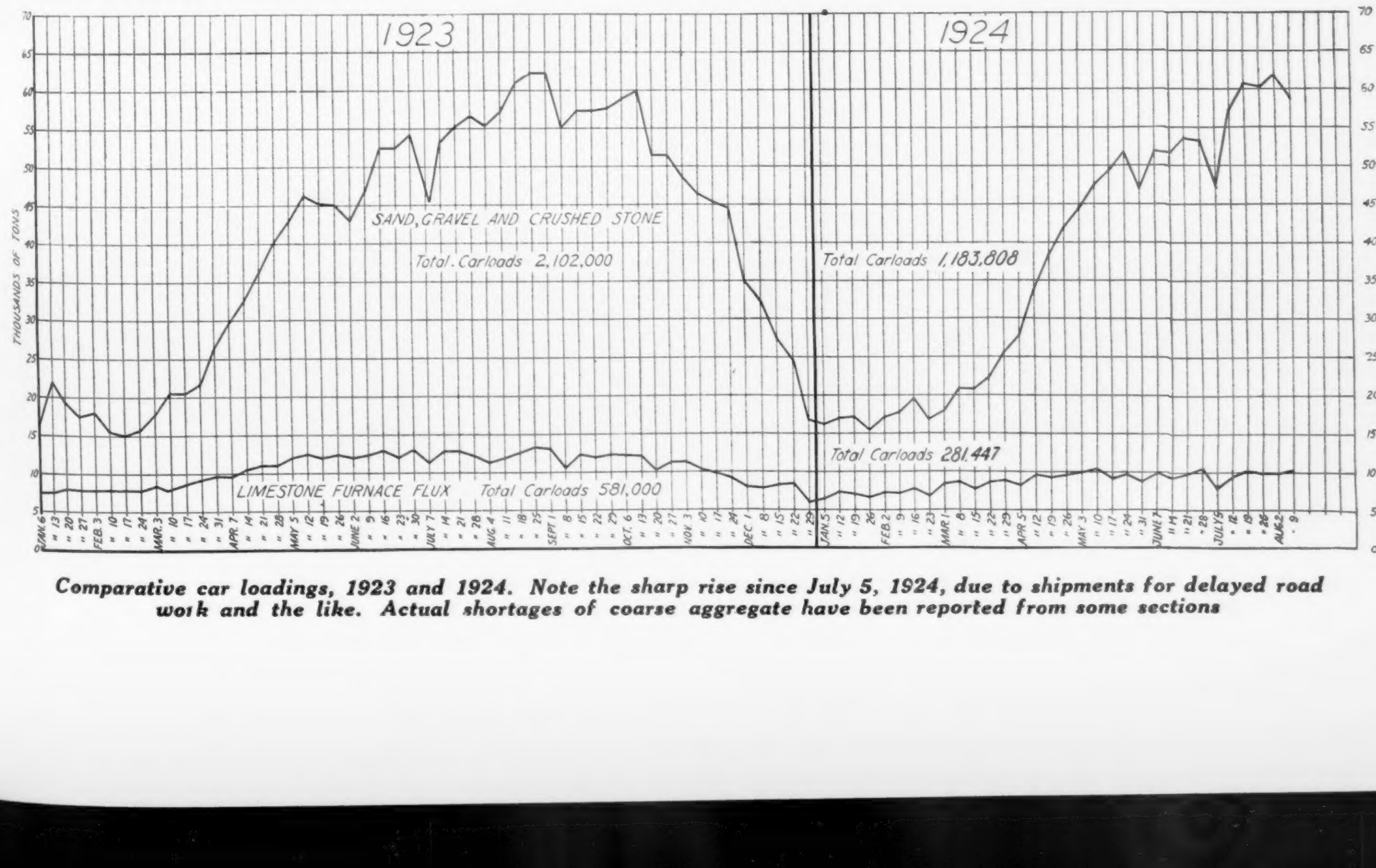
Because business here is dull and the demand far less than the available possible supply producers make the mistake of cutting prices when the only logical and defensible course is to put them up. For under conditions of maximum demand and production it is seldom possible to produce sand for as low as 30c; and, as every operator knows, production costs rise rapidly as production decreases. It is often better business judgment under such conditions to shut down altogether and write off overhead and depreciation as a loss, than to continue operation and add to these an operating loss, depletion, and enhanced depreciation as well.

We suspect the only reason more operators do not pursue this course of closing down and waiting for better conditions is that they hate to see the other fellow derive any possible benefit from such closing. The other fellow certainly is not deriving any benefit so long as he sells at 30c.

The other alternatives are a game of "freeze out" and consolidations. There are doubtless business and competitive conditions which justify these methods; but operators should not sit in a game of this kind unless they have a good hand and are well supplied with "chips."

Sand and Gravel

The figures of the Geological Survey on sand and gravel production in 1923, given in Rock Products, August 23, show an increased production of about 48% over 1922. In part this comes from new companies but it is probable that the greater part comes from increased production of companies which have been in the business for some time. A large number of such companies built new plants in 1923 or greatly improved and added to old plants. At present the tendency seems to be toward larger units and combination. Quality has been more than ever appreciated in sand and gravel, and the adoption of rigid specifications by highway commissions, and the study of the design of concrete mixtures, has impelled producers to place a higher grade of material on the market. Naturally those deposits which contain high grade material are being worked for heavy tonnages. Consumers will buy such sand and gravel and pay the freight rather than use an inferior grade of local material at a lower cost. An example of this is to be found in the Montgomery, Ala., district from which gravel is shipped into five states. The nearest large markets to this district (Atlanta and Birmingham) are 100 miles from the plant and cities 400 and 500 miles away depend upon this district for its supply. In the big cities of the Eastern states the same tendency toward combinations and larger units, both of which mean increased production, is found. Naturally this increased production means a lower plant price and this is shown in the Geological Survey's figures, the average plant price for 1923 being 65 cents as against 68 cents in 1922. Prospects are that the 1924 production will equal that of 1923.



Comparative car loadings, 1923 and 1924. Note the sharp rise since July 5, 1924, due to shipments for delayed road work and the like. Actual shortages of coarse aggregate have been reported from some sections

Rock Products Plants Near Biggest City

Water Transportation and Barge Loading—Great Market for Special Sands

By Edmund Shaw
Editor, Rock Products

THE greater part of the concrete aggregate used in New York and Philadelphia comes in by water. New York especially depends on water transportation. The standard barge holds from 600 to 650 yd. and barge measurements are taken when the cargo is to be sold. It is for this reason probably that yards instead of tons are the units used in the New York market.

These barges draw too much water to be used on the rivers of the South and Middle West, or on the Ohio. Six to seven ft. is about as much water as is available in these rivers, but the barges around New York draw 9½ ft. to 10 ft. when loaded. With such a heavy cargo above the water (for practically all the barges are of the flush deck type) one would think that there would be danger of the barge "turning turtile." Such accidents have occurred but they are very rare and only occur when a high wind and a heavy sea lift the barge until a line through the center of gravity falls outside of the base, when, of course, the barge must roll over. The rarity of such accidents is a sufficient answer to those who have objected to the use of flush deck barges on rivers, for the lessened depth and greater proportionate width make the river barges far more stable.

Problems of Barge Loading

Loading barges presents problems with which the man who operates a plant beside a railroad is not familiar. The plant cannot be placed on the dock and to obtain sufficient depth of water the dock must be placed some distance from the shore. The standard method for transporting the material from plant to dock and loading it on the barge is the use of belt conveyors.

A typical installation, which I visited, was that at the plant of the O'Brien Brothers Sand and Gravel Corporation, Port Washington, L. I. Two belts run under the plant bins and discharge the material on two other belts which take it under a highway, through a concrete lined tunnel and then out to the dock, a total distance of 615 ft. The capacity of these belts is such that two 600 yd. barges are regularly loaded in an hour, and by increasing the speed of the belt slightly three barges may be loaded. As the transportation is carried on by an independent concern, such speed in loading is important.

This plant, by the way, is one of the newest and best of those in the neighborhood of New York, and it will be described in detail in an early issue.

Market for Special Sands

New York is a great market for special sands, filter sands, sand blast sands and sands for special sorts of plaster and stucco work. The plants that produce these are mainly in the south half of New Jersey in which the deposits of sand and gravel are practically pure silica. Some of them are worked for glass sand and for silica to grind for making china ware and paint filler. Only one of these plants was visited, that of the Menantico Sand and Gravel Co., at Millville, N. J. The sand and gravel at this deposit is almost as white as snow and the grains are almost spherical in shape. The hardness and the shape of the grains are qualities which cause this sand to be especially prized for use with the sand blast and for making filters and shipments are often made to points several hundred miles away, the quality of the material causing it to be preferred to local sands at a lower price and much lower charge for freight.

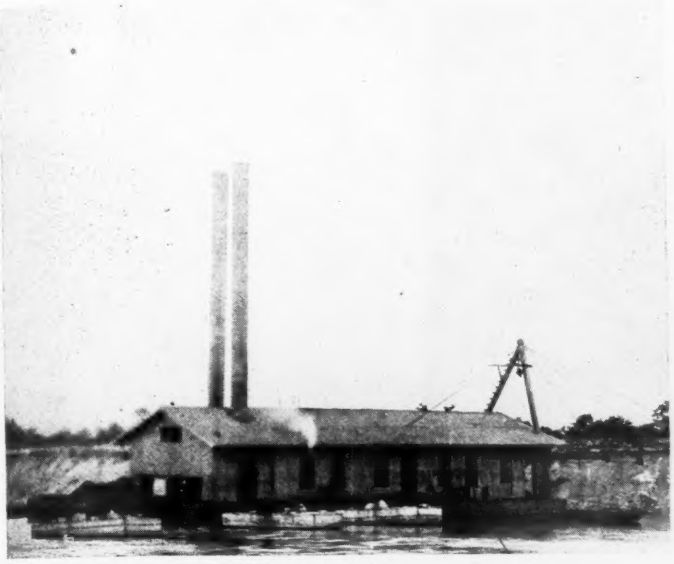
Sand for Brick Making

The Menantico company is very well known to sand and gravel producers as its president, Hugh Haddow, has been so long connected with the National Sand and Gravel Association and has played so important a part in the work and development of the association.

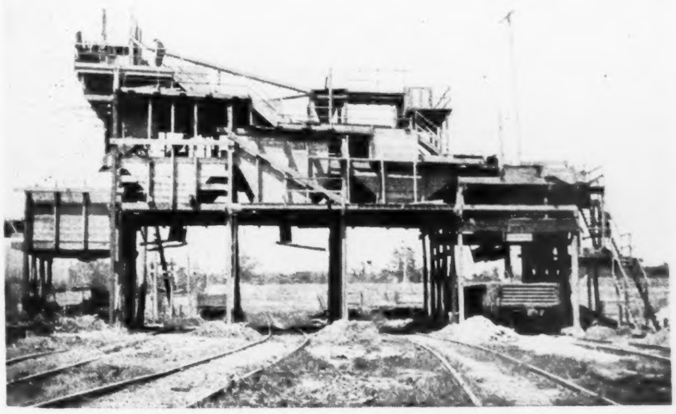
And speaking of special uses for sands, one plant was visited which sells about 90% of its sand production for making clay brick. This was at Croton-on-Hudson, 34 miles above New York and across the river from the great brick yards at Haverstraw and nearby towns from which seven to eight million brick are shipped daily. The sand is ordinary washed concrete sand containing about 2½% of clay. It is mixed with clay in the proportion of 1 to 5, and the brick makers prefer it to

Left—Barges used for conveying sand and gravel from plants near New York. Right—Conveyor belt and loading dock of O'Brien Brothers plant on Long Island

sand which might be obtained more cheaply because of its constant grading and uniform clay content. The company, the Croton Sand and Gravel Corp., has built a well designed plant, from which two to three barges a day are shipped and the installation includes a conveyor belt for loading barges.



Left—Steam dredge of Menantico Sand and Gravel Co., near Millville, N. J. Right—Loading washed sand which is to be used for mixing with clay in making brick



Left—Morris Plains plant where interesting screening experiments have been made. Right—Plant of the Commonwealth Quarry Co. (F. W. Schmidt) near Summit, N. J.

One of the most interesting visits made was that which included the crushed stone and sand and gravel plants of F. W. Schmidt and his associates. Of especial interest was the visit to the Morris Plains gravel plant, in which Mr. Schmidt has been experimenting with gravity screens for the past two years. It is probable that the limitations and possibilities of the gravity screen were never given so thorough a study before. This study has included wet and dry screening, the use of various screen materials, and every combination of length and slope and manner of feeding that the construction of the plant would permit. Mr. Schmidt does not consider that he has yet solved all the problems, but the results obtained were astonishing to one who had considered the gravity screen to be a somewhat crude affair.

Mr. Schmidt who is well known to Rock Products readers as past president of the National Crushed Stone Association, has just built a plant at Bound Brook, N. J., to replace the plant destroyed by fire a few months ago. The flow sheet represents a lifetime of experience in crushing and screening hard rock and hence is of unusual interest to quarrymen everywhere. It will be described in an early issue of this paper.

Gravel Shortage in New York

As this is being written the New York papers are pointing out that there is a shortage of gravel in the city. It is amusing to one acquainted with the industry throughout the United States to read that gravel is a "by product" of the sand industry. The producers of some other cities, Des Moines for instance, would take a far different view of the matter.

One authority on the building materials market says that the reason for the gravel shortage is due to the change in the character of the construction about the city. This season the dominant construction is that of mercantile, industrial and purely commercial buildings, the bulding of apartments and dwelling houses having slackened somewhat. This also accounts for a lessened demand for brick.

The latter part of August brought the peak of the demand for concrete aggregate, the continued rains of spring and early summer having delayed highway and other construction in which concrete is used. This is also a factor in the gravel shortage.

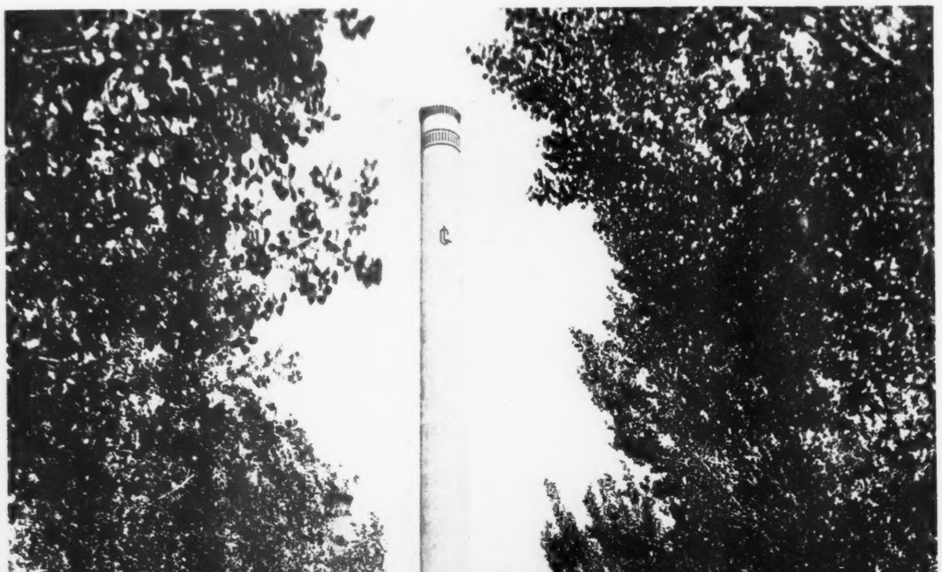
The Aesthetic in Cement Plant Design

WE have shown so many pictures recently of the Victorville (Calif.) plant of the Southwestern Portland Cement Co. that possibly some readers may suspect that we are particularly fond of this plant. To be frank, we are. In all our editorial travels we (editors) have never enjoyed anything more than the inspections of the Victorville plant—not merely because of the whole-hearted hospitality extended, but because here is a cement mill really pleasing to look upon.

That is our explanation in publishing the views herewith—to convince cement-mill men elsewhere, who have never had the good fortune to visit this plant, that it really is a beauty.

Many employers are coming to believe that there is a very real, even though intangible, relation between personal efficiency and mental healthfulness on the part of employes and the character of the surroundings in which they work. Henry Ford must believe in this relation or he would not have "dolled up" his cement plant as he has.

New concrete-brick office and laboratory building of the Southwestern Portland Cement Co. at Victorville, Calif.



"Avenida de Eucalyptus" at the Victorville plant of the Southwestern Portland Cement Co.

Nor do we believe the mental reaction to nice looking plants is confined to the employes who work there continuously. In the case of Carl Leonardt, president of the Southwestern Portland Cement Co., at least, it has resulted in a personal satisfaction, pride and joy second only to that experienced in our acquirement of our first automobile.

And moreover such plants as this are the finest kind of advertising for the portland cement industry and add much to its prestige with the general public. Fortunately, Mr. Leonardt's plant is on the main line of the Santa Fe railway into Los Angeles from the East, where thousands of transcontinental travelers get a fleeting glimpse of it in passing.

California Gravel Plant Is Dynamited

AN explosion Friday morning, August 22, wrecked the power plant and warehouse of the C. B. Hollingsworth Co. at its gravel pit at Lomita, Calif.

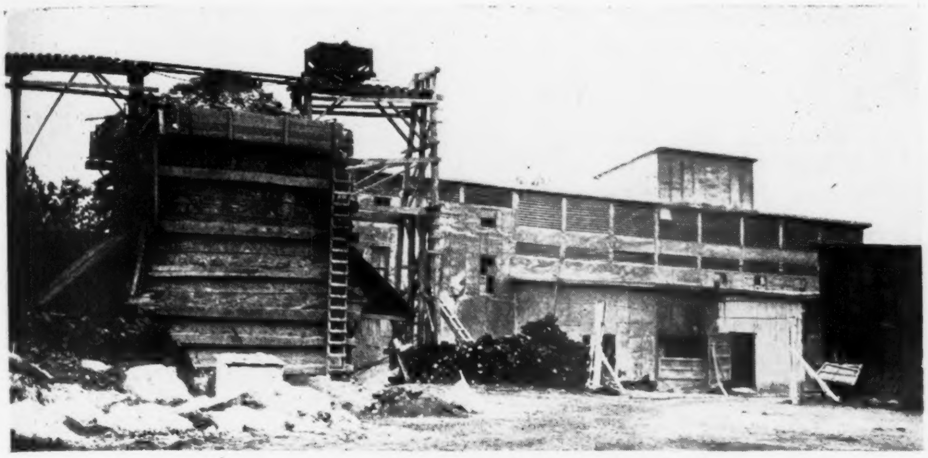
According to deputy sheriffs investigating the case, dynamite stolen from the company's storehouse was used to blow up the plant. Though no clew as to the perpetrators has been unearthed, the officers are convinced, after talks with company officials, that someone with a fancied grievance set off the blast for revenge.

The building, together with machinery, was almost completely demolished. Part of the roof was blown off and the rest of the building collapsed. Forty sticks of dynamite, the entire contents of the company's powder magazine, was used in the blast.

According to Mr. Hollingsworth, the plant will be immediately rebuilt.

O'Neals Lime Works to Build New Lime Plant at Calera, Ala.

PLANS are under way for the erection of a new lime kiln and limestone crushing plant at Calera, Ala., where the O'Neals Lime Works owns in fee simple 9,000 acres. When the new plant is completed the company will be in position to furnish lime of all kinds on an analysis basis of lmiestone to any test as well as to manufacture of various by-products from limestone.



One kiln of the three in use and hydrating plant of O'Neals Lime Works. A more modern plant will take the place of these

In connection with the success of 45 years of experience in the lime business this company has also furnished a considerable yardage of crushed limestone on the Birmingham-Montgomery highway. Engineers and laboratories show the analysis of limestone to be higher standard than required in all the test.

Assistant Secretary Smith of the company advised that no difficulty is experienced in getting orders. The present plant is running night and day.

The company consists of some of the best known men in the Birmingham district. Most of the stockholders are Birmingham people. The office of the company are John H. Adams, president; W. W. Wood, vice president; Frank C. Marquis, vice president; Albert Stradford, secretary and treasurer; Dr. W. C. Gewin, chairman of the board.

With an able and efficient expert in lime and cement manufacture, E. M. Confer as superintendent at the plant, the brand of Eureka and Snow-White limes will be kept among the foremost in the lime industry. A new quarry of very high calcium limestone has been developed this year by Mr. Confer.

O'Neals lime was used exclusively in some of the larger buildings in Birmingham and is beng used in many of the buildings being erected in Birmingham at this time. —*Birmingham Age-Herald.*

[A brief description of the O'Neals plant and quarry was a part of an editorial letter published in the April 19th issue of ROCK PRODUCTS this year.—Ed.]

Death of Alexander G. Morris

ALEXANDER G. MORRIS, formerly prominently identified in business in Centre and Blair counties, died at his home at Bellefonte, Pa., Aug. 21, in his 90th year. He had been in declining health for the past year and death was due to ailments incident to advanced age.

Mr. Morris was formerly president and general manager of the American Lime & Stone Company and his activities in years past were distributed over several counties. He is regarded as the founder of this industry in this part of the state.

He resided in Tyrone for many years but for the past decade had been a resident of Bellefonte, where he lived a retired life. He was a member of the Episcopal church and for a number of years served as a trustee of the Huntingdon Industrial Reformatory.

Four sons and a daughter survive as follows: Robert, A. G., Thomas King and Charles Morris and Miss Lydia Morris.—*Altoona (Penn.) Mirror.*

Chicago & Alton Railroad Abandons Its Ballast Quarry at Pearl, Ill.

THE Chicago & Alton's stone quarry at Pearl, Ill., on the western division, has recently been abandoned and the machinery dismantled and brought to Bloomington and stored. The quarry had not been used for the past three years. It was abandoned because the rocks had been taken out so far back into the hills that it had become too expensive to strip them and get out ballast.

This quarry covered a tract of 36 acres, and was purchased by the Alton when the road was first projected west in the 70's to furnish stone ballast. For 40 years, the company has taken out crushed stone. The plant was operated about six months in the year, and the number of cars loaded there reached into the hundreds of thousands. In the neighborhood of 22 company men were employed and six or eight teams were used in hauling the stone to the crusher.—*Bloomington (Ill.) Bulletin.*

Progress on Ohio Lime and Stone Company's Plant

THE Ohio Lime and Stone Co. will soon have its stone crusher in operation. It has capacity of 45 tons an hour. As soon as this is completed work will begin on the lime plant of six kilns of 72 tons capacity. It will cost more than $85,000.—*Toledo (Ohio) News-Bee.*

Profit from Agstone Is Fifteen Bushels of Wheat Per Acre

A RECENT visitor at the Soil Experiment Field at Clayton, Ill., asked the question, why parts of the wheat and oats fields on the station looked so promising, while other strips through the fields looked so grief stricken? After it was explained that the good looking strips or plots of wheat had received limestone and had grown a good crop of sweet clover, while the poor, sickly looking plots had never been treated, the visitor asked for the yields per acre on these respective plots. R. W. Scanlan of the Soil Extension Department of the University of Illinois answered the question. His answer will interest all farmers. It follows:

Where four tons of limestone per acre has been used and sweet clover plowed under, the last four years the average of corn has been 59 bu. compared to only 35 bu. where the land has not been treated other than rotation. The average wheat yields following limestone and sweet clover has been 27 bu. per acre but only 15 bu. on the untreated plots.

These yields are of interest to the farmers, who consider the cost of producing a crop and compare it with what is left in his pocket, or to be more exact, to help pay off some of his outstanding debts. People who have studied the costs tell us that on land valued at $200 per acre it requires 41 bu. of corn at 65c to pay for our labor of plowing, cultivating, taxes and interest on the investment. The treated land on the experimental field gives us a yield of 59 bu., so the profit is 15 bu. but the untreated land producing only 35 bu. actually gives us a loss.

The cost of liming an acre of soil with three tons per acre is close to $10 and the treatment will last for 15 years. Of course, a crop of clover would have to be plowed under occasionally to keep up the nitrogen supply. No crop is lost as the crop may be seeded in the spring with oats or in the wheat, can be pastured in the fall and is plowed the following spring for corn. The effect of this treatment on the corn is showing up nicely on the experimental field at present. Every farmer can have a few acres of this valuable soil builder on his farm if he will only try.—*Carthage (Ill.) Journal.*

Motor Truck Show in Chicago in October

THE first National Motor Transportation Show in the history of the industry will be held in Chicago, October 21 to 27, at the American Exposition Palace on Lake Shore drive, a building recently completed at a cost of $10,000,000. The show is to be held under the auspices of the Motor Truck Industries, Inc., an association which represents the leading truck manufacturers of the country.

Most member manufacturers have taken space and there is a gratifying demand for the remaining desirable locations. Busses, rail cars, trailers and all units essential to motor truck transportation will also be exhibited. Within the next few days nonmember manufacturers will be allowed to apply for space. Response has been such that officials are certain the show will be a great success.

The show is to be educational in scope and is intended to be of real practical value to those who attend. A program of demonstration is to be held daily in a large field adjoining the exposition building. William Hallanger, general manager of Motor Truck Industries, is now at work planning the demonstration program. According to Mr. Hallanger, all phases of truck performance are to be thoroughly exhibited. Various makes of trucks will be used so that every branch of motor truck transportation will be included.

An effort will be made to restrict admission to those who are genuinely interested in motor truck transportation. Tickets and invitations are to be sent to truck and automobile dealers, fleet owners and owners of bus lines. Although the show room has an area of close to 70,000 sq. ft., it is felt that the practical value of the exhibit to fleet owners and others in the truck business would be greatly detracted from if the doors were opened to the general public.

"It is our intention," says Mr. Hallanger, "that this show will be a definite help to truck owners. Those who attend the exhibit will no doubt glean a number of excellent ideas and suggestions that will tie in with their own business. Those who have already been notified have evinced a very lively interest. This exhibition will be the first distinct motor truck show ever held since truck manufacturers in the past have always combined their exhibitions with those of passenger car builders."

Announcement of Chemical Exposition Date

OWING to some confusion which is believed to exist in a few quarters regarding the holding of the next chemical exposition, an announcement has been sent out by the International Exposition Co., under whose management the Exposition of Chemical Industries has been held since 1915. Numerous inquiries have been received by the management which lead it to believe that many interested parties are of the opinion that there will be a chemical exposition this year. This is not the case. There will be no chemical exposition in 1924; the next Exposition of Chemical Industries will be held September 28 to October 3, 1925, at the Grand Central Palace, New York.

Make Your Hotel Reservations Early

THE NATIONAL CRUSHED STONE ASSOCIATION will hold its next annual convention at the Hotel Gibson, Cincinnati, Ohio, January 12, 13, 14, 15, 1925.

Unusually good provision has been made for meeting room and exhibition space.

Plans are being made for the biggest and best convention in the history of the quarry industry.

Wise quarry operators will make their plans to attend now.

A. P. Sandles, Secretary, National Crushed Stone Ass'n, 405 Hartman Building, Columbus, Ohio, will see that you are taken care of.

Attempt to Enjoin Quarry Company and Cement Company from Using Explosives

THE St. Louis Post-Dispatch says that injunction suits to restrain the Big Bend Quarry Co. and the Altoona Portland Cement Co. from using dynamite and other high explosives at their quarries in St. Louis County, and to compel them to eliminate the clouds of rock dust that settle on vegatation about their plants, were filed at Clayton, Mo., recently by Prosecuting Attorney Jones. The Big Bend concern operates a quarry at Luda avenue and Wall street, Maplewood, and the cement company a plant at Continental station, on Gravois road.

According to the petition, residents living within two miles of the plants are disturbed day and night by the loud explosions incident to blasting operations, windows are shattered and cistern walls cracked and destroyed. The complaint further alleges that rock and cement dust which rises in clouds from the plants settled on the fields and gardens for miles around, causing crops to wither and die.

[In comparison with the statement in the last paragraph, one of the farmers who lives near the Dixie Portland Cement Co's. plant, a short distance from Chattanooga, Tenn., told the writer that the fertility of worn out soils near the plant had been brought back to a remarkable degree by the lime dust which has escaped from the plant and settled on the ground.—Ed.]

First of Alabama Coal Mines to Use Rock Dust "Sprinkling"

SAYRE mines, in the western part of Jefferson county, property of the Gulf States Steel Co., is the first coal mine of the state to thoroughly "dust" the interior with limestone dust, the new method used to minimize danger of explosions in the mines.

Limestone dust will replace water sprinkling in the course of time, the claim being made that the latter method means constant sprinkling, while with dust this will suffice for some time.

The Associated Companies, handling compensation insurance in the district, has recommended the limestone dust method of sprinkling mines and otherwise using the dust in making "shots" in the mines.

The Sayre mines used 20,000 pounds of limestone dust in putting in the improvement, it was announced. A test was made with the dust several weeks ago and its actual use begins a practice that promises to be followed extensively, it is believed.—*Birmingham (Ala.) News.*

Ohio Quarry to Be Drained and Equipped for Production

IT has been learned that Receiver Burns, who has had charge of the Highland stone quarry near the end of West Davis street, Tiffin, Ohio, since it was thrown into litigation, is endeavoring to drain and equip the plant for the producton of stone and that it may be in operation shortly.

It is said that the difficulty of draining has been overcome in a novel manner. By blasting the place deeper it appears that a crevice has been opened through which the water is escaping, much as it does in the "sinks" in the eastern part of the county.

In former years a great quantity of stone was taken from this quarry.—*Tiffin (Ohio) Advertiser.*

South Carolina Fertilizer Plant Is Being Rebuilt

THE plant of the Merchants Fertilizer and Phosphate Company which was destroyed by fire of unknown origin July 29 is being rebuilt on the same location near Five Mile and the Seaboard Air Line tracks.

The damage of the fire amounted to around $160,000, but the loss was not so great to the company as it carried insurance. The fire began in the interior of the main structure and was gaining rapid headway before it was detected by the night watchman. It spread with such fury that efforts to put it out were futile. The fire began shortly after midnight. Between 4,000 and 6,000 tons of fertilizer were consumed in the burning building.—*Charleston (S. C.) News Post.*

Politician Attacks Gravel and Cement Producers as "Trusts"

OUT in Washington, where politics have often assumed a peppery flavor, a candidate for the state senate has applied "trust busting" tactics, to a sand and gravel producing company with an incidental "swipe," at a cement company. ROCK PRODUCTS of course knows nothing of the merits of the case, but would point out that it is not uncommon for a producing company to receive a contract because it has the equipment to make material that will meet specifications, even where "influence" would like to throw it in another direction.

Out of the columns of charges and counter charges that have been published, the following excerpts from the *Spokane (Wash.) Chronicle* seme to contain about all that is of more than merely local interest:

"Charges and counter charges, flavored with terms stronger than 'liar,' are being hurled by politicians, highway contractors and officials of the Hawkeye Sand and Gravel company of Spokane, following statements made by Mayor Willis E. Mahoney of Tekoa, democratic candidate for the state senate, in a letter to the *Chronicle*.

"Mayor Mahoney charged that the local firm had the 'Eastern Washington monopoly on sand and gravel highway contracts,' and challenged recent highway figures given by State Engineer James Allen, declaring them to be 'false and misleading.'

"Mayor Mahoney declared that state highway contracts specify 'Portland cement.' He said that only one firm in the state manufactured this product, which has resulted in a monopoly. He declared further, that the sand and gravel monopoly rests with the Pioneer Sand & Gravel Co. in Western Washington and the Hawkeye Sand & Gravel Co. in Spokane.

"'In the resurfacing of the Inland Empire highway out of Spokane, the contractor was forced to buy from the Hawkeye and pay 40 cents more a yard for sand than he could have bought it for from another Spokane concern,' Mayor Mahoney stated.

"'It's a lie; I could have bought my sand and gravel from any firm in the city,' said J. H. Collins, contractor in charge of the work. 'I could have opened my own pit if I wanted to. The state doesn't say where we must purchase our material, but it does say that it must answer the state test.'

"W. G. Ramage of the Hawkeye Sand & Gravel Co. and J. S. Austin, sales manager for that company, pointed out how they secured the contract for the Inland Empire highway job.

"'This contract provided that the sand and gravel should grade a great deal similar to the grade on the West Side,' said Mr. Ramage. 'We hadn't expected to secure the contract, it being our belief that it would go to another company.

"'However, this firm informed Mr. Collins that he would have to accept their material on the job and made no guarantee that it would answer the test. As a result we received the contract, but not until after we had deducted 10 cents from our bottom price. Mr. Collins did not accept our bid until about a week before actual construction work was started.

"'We are equipped so as to furnish material that will meet the state test and for this reason we received the contract.'"

New Ohio River Sand and Gravel Dredge at Huntington, W. Va.

THE bucket dredge, built in Huntington, W. Va., by the Wilson Sand & Supply Company, not only will be capable of digging 2,000 cubic yards of gravel and sand a day, but will separate the two and deposit them in loading barges on either side of it at one operation.

It is the larger dredge of its kind between Pittsburgh and Cincinnati and the first to be built in Huntington.

One more week will mark its completion. Charles R. Wilson, president of the Wilson Sand & Supply Company, said Thursday. It is to be turned over to the Ashland Sand & Gravel Company, which is owned by the Wilson Sand & Supply Company and other interests, and will be put to work in the river just below Ashland.

The dredge is of steel construction with six water-tight bulkheads which render it unsinkable.

With its chain-buckets the dredge digs the gravel and sand out of the bed of the river. It throws the material into a rotary screen, washes and separates the gravel from the sand, depositing each in separate loading-barges.—*Huntington (W. Va.) Advertiser.*

More Missouri Aggregate Producers Offended

"THE State must approve Breckenridge lime stone. If the highway commission will not, we will take it before the legislature," declare the men who went before the state Highway Commission in Jefferson City last week in an effort to get the state's approval of our rock.

Although R. E. Chaffin, W. O. Hart and G. H. Rose, representing Breckenridge's interests, were unable to see Mr. Piepmeier, they laid before the highway department samples of Breckenridge rock which opened its eyes to the situation. The officials were well pleased and greatly surprised at the display and will send men to inspect the situation. It is hoped that this inspection will be more satisfactory than the last one.

Following an interview with Mr. Sacks of St. Joseph, two men were sent here recently presumably to inspect the Breckenridge rock. After being shown over the Bush, Cox, Bottom, Hall and Gill lands the men picked up a piece of "cotton rock," the very poorest grade of rock in this vicinity. Regardless of the fact that they said they had no intentions of sending the sample to the state laboratories, at Jefferson City they did so.

The department had reason for surprise to find that the samples taken to Jefferson City last week are representative of Breckenridge rock rather than the "cotton rock" then in its possession.

Those who are closely in touch with the situation are confident that the state will be forced to give Breckenridge rock a fair showing alongside others and put on the approved list. Good business will not permit the shipping of rock from Kansas and other states to make Caldwell county roads when there is sufficient rock in this county alone to complete the state's entire road program.

In a recent letter to Mr. Chaffin, Mr. Cameron of the Cameron, Joyce Co., stated he is ready to put a crusher in operation here as soon as the state approves the rock. Due probably to the interview with the highway department last week, a Kansas City party called Mr. Chaffin last Saturday, saying that he would drive here this week with the view of looking over the rock here, with the probability of putting in a crusher.

Mr. Rose is prominent among the local enterprisers who wish to finance and manage the crusher upon a local basis.

It is very evident that it will be no trouble getting a crusher into operation here as soon as the state approves the rock.—*Breckenridge (Mo.) Bulletin.*

Dakota State Cement Plant Employs New Superintendent and Chemist

AT the August session of the state cement commission of South Dakota, William Fouden, of Nashville, Tenn., was employed as superintendent of operation of the state cement plant nearing completion. William Ernst, of Demopolis, Ala., was employed as chief chemist.

The Corb-Morris 40 acres located east of Rapid City, S. D., was purchased as a shale pit for the plant. The price paid for the tract was $8000. Negotiations for machinery to operate the shale pit are under way.—*Sioux City (Iowa) Journal.*

Artificial Graphite

A RECENT report of the Geological Survey places the output of artificial graphite (made at Niagara Falls, N. Y., at 26,761,015 pounds for 1923. This was more than twice the output of 1922.

Georgia Cement Plant Burns and Is Rebuilt in Record Time

THE plant of the National Cement Co. at Rogland, a small town in Georgia, north and west of Atlanta, was burned on August 16. Immediate steps were taken to repair the damage, heavy machinery was brought in by express and the latest reports indicate that the plant would be producing in the early part of this month.

According to local papers, the loss was originally estimated at $1,000,000 but later reports have estimated it at three-fourths that amount.

The stock house, packing house, machine shop and nearly all the raw grind were destroyed.

When the blaze was discovered the flames had progressed so far, fire fighters were unable to control them. The plant was built 12 years ago and has changed hands several times. George E. Nicholson, of Kansas City is president of the firm which now controls the plant.

President Nicholson and his associates made a record run to the plant and they remained on the ground arranging for immediate rebuilding of the burned plant units. A news dispatch from Birmingham says that a contract for the rebuilding was let on the 20th. By disregarding expense and bringing in whole car loads of heavy machinery by express the plant was restored in what is probably as short a time as any similar piece of work has occupied.

The original plant had a capacity of 3,000 barrels per day.

Plant to Manufacture White Portland Cement on West Coast

L. V. BENTLEY, president of the White Portland Cement Co., Los Angeles, Cal., has just made known the details of the purchase by that company of an 1800-acre tract of land at Saugus and the plans for a large cement manufacturing plant. The purchase price of the 1800-acre tract involves $600,000 and the final papers are now in escrow.

The White Portland Cement Co. is a new $3,000,000 corporation which is backed by San Francisco and Los Angeles capitalists and which is organized for the purpose of manufacturing white cement for distribution on the Pacific Coast and east as far as the Missouri river. At the present time the nearest white cement manufacturing plant is located at York, Pa.

Negotiations are also under way for the purchase of a 15-acre industrial site in East Los Angeles on which to erect the cement plant. As yet, the location has not been made public. However, industrial engineers are already busy preparing engineering plans for the first unit of the plant which is to be built at an estimated cost of $750,000.

When this unit is completed others will be built until the entire $3,000,000 capitalization of the company has been absorbed at the manufacturing plant and in the development of the 1800-acre tract. The first unit will have a manufacturing capacity of 1000 bbls. a day.

The plant will have its own power plant according to present plans.

It is expected that the first unit of the plant will be completed and in operation by the first of the year.

The present officials of the company are: L. V. Bentley, president; Cecil J. Rhodes, C. H. Shattuck, W. B. Wilkerson, I. C. Ellis, T. H. Cannan, and Lewis Cruickshank. The present board of directors will be changed to include several prominent San Francisco capitalists.

Pacific Portland Cement Co. Consolidated, Begins Production

THE first completed unit of the new plant of the Pacific Portland Cement Co., Consolidated, located on San Francisco bay, not far from Redwood City, was opened Aug. 25. It was planned to have operations in full swing by September 1. When all units are completed the company will have capacity employment for 500 workers.

The plant stands in a ten-acre tract and represents an investment of approximately $3,000,000. Capacity will be 2,500 barrels daily and the annual output is estimated at $2,000,000. The plant is to be served by rail and water transportation. The cement will be manufactured from oyster shells on the floor of the bay.

The company has about 500 shareholders, mostly Californians. June 30, capital was increased from $6,000,000 to $10,000,000 and the word "Consolidated" added to the company name.—*(San Francisco) Pacific Builder.*

New Manager of Railways Bureau Portland Cement Association

A. C. IRWIN, for several years engineer of the Portland Cement Association Structural Bureau, general headquarters 111 West Washington street, Chicago, has been appointed manager of the Railways Bureau, succeeding D. A. Tomlinson, deceased.

For the past two years Mr. Irwin has been devoting a great deal of his time to problems concerning the development of joint committee specifications and similar special work, having co-operated in this with a number of committees with which he was affiliated.

Mr. Irwin was for a number of years a member of the engineering staff of the Chicago, Milwaukee and St. Paul Ry. and has long been prominently identified with the activities of various railway engineering organizations.

New York to Build Many Miles of Concrete Road

OF the 8,000 miles of concrete pavement, which, it is estimated, will be added to the permanent road program of the United States this year, about 2,000 miles will be within the New York touring district. This is the statement of B. H. Wait, district engineer of the Portland Cement Association, in commentng on conditions in the construction industry. He said:

"With the lowering of costs of labor and materials, there has been an increase in activities in cities for the completion of necessary pubic works, this being particularly true in placing permanent pavements. Reports from the Portland Cement Association show that in the last six months 14,500,000 square yards of concrete streets have been awarded, the equivalent of more than 8,000 miles of thirty-foot width pavement.

"This yardage is greater than the total awards for the year 1922 and exceeds by more than 2,000,000 square yards those for the corresponding period of 1923, the best previous year."—*Rochester (N. Y.) Dem. and Chronicle.*

Marquette Cement Co. Contracts for Quarry Drilling

D. F. WELDON, local drilling contractor, has secured the contract for drilling approximately 4,000 feet of test holes for the Marquette Cement Co. of Cape Girardeau, Mo. The holes will be drilled on the properties of the company in the vicinnity of Cape Girardeau for the purpose of ascertaining the location and extent of limestone deposits. The holes will be from 100 ft. to 150 ft. in depth.

The drilling contracts were awarded at a price ranging from $1.75 to $2.25 per ft., the larger part of the work being done at the latter figure.—*Piedmont (Mo.) Banner.*

Progress on New Ohio Cement Plant of Southwestern

MORE than 400 men are employed in the construction of the buildings comprising the million dollar plant of the Southwestern Portland Cement Co., at Osborn, Ohio. It is expected about 350 men will be employed regularly at the plant when the work of manufacturing cement commences. —*Cincinnati Enquirer.*

Increasing Use of Oil for Burning Portland Cement

CURRENT reports of cement plants under construction show that four of these are to be equipped with oil burners. It is also reported that some western plants are contemplating a change to oil burning equipment.

Kansas Portland Cement Co.'s New Plant Ready for Production

PRINCIPAL units of the Kansas Portland Cement Co.'s new plant at Bonner Springs, Kans., have been completed and the organization now is prepared to produce cement at the rate of 3000 bbl. a day. The investment in the new buildings and equipment is more than $1,250,000.

The present plant, a group of buildings covering about 8 acres, has arisen on the site of the old buildings of the Bonner Portland Cement Co. These structures were torn aside as construction of their more modern successors progressed. This was accomplished in such a manner the production of cement was halted altogether for only a short time, although the construction work has been in progress approximately one year.

In January, 1923, the Bonner Portland Cement Co.'s holdings, a plant built in 1908, and 300 acres of land, including quarries, was bought by the International Cement Corporation of New York. The purchase price was $600,000. The Kansas Portland Cement Co., a subsidiary of the International company, was formed the same month.

About a year ago the work of razing the old dry process plant was started. Only a little later, work on the new plant began. As it stands completed now it is one of the most modern in the country. The new wet process of manufacture is used.

The structures which comprise the new plant are connected with the quarries by a private railroad. In all the cement company's holdings include 320 acres of land.

The plant buildings have concrete foundations and steel frames. One large structure houses the rock crushers. Here the company's material trains are run directly into the building, releasing their loads into hoppers. Three hundred 5-ton cars of rock can be crushed daily in this building.

A conveyor carries the crushed rock into a building for the storage of this raw material of cement. This structure is 100x200 ft. A bridge links it with the raw-grinding building.

Adjoining the grinding building is the four-story structure which houses the three kilns. These are 220 ft. long and 9 ft. in diameter. They weigh 1200 lb. to the lineal foot and the temperature in them when operating is 3000 deg. Each kiln has a stack 200 ft. tall, tapering from 15 ft. in diameter at the base to 9 ft. at the mouth.

The other principal buildings are a tall structure of monolithic concrete where 120,000 bbl. of cement can be stored; a packing building, where 30,000 sacks of cement can be filled daily and loaded on freight cars, and a power plant housing transformers and motors.

In addition to these structures a machine shop building is under construction.

The buildings are just east of Bonner Springs on the Union Pacific Highway.

Two hundred and fifty men are employed at the new plant.

The executive offices of the Kansas Portland Cement Co. are in the Federal Reserve Bank building. J. A. Lehaney is general manager.—*Kansas City Star.*

[A detailed description of the new plant will be published in an early issue of ROCK PRODUCTS.—Ed.]

Rates on Kaw River Sand to Missouri Points

A DISPATCH from Washington to the *Kansas City Journal Post* says:

"Carload rates on sand from Turner, Kans., to Galloway and Cassidy, Mo., are found not unreasonable, while rates from Turner to Bolivar and Cabool, Mo., are held unreasonable in the report of John T. Money, examiner, submitted today to the interstate commerce commission. This decision is recommended in the case of the Kaw River Sand and Material Company against the Santa Fe railroad and other carriers.

The Kaw River Company's plant is about seven miles west of Kansas City and three-quarters of a mile west of the Kansas City switching limits. The examiner holds that rates from Turner to Bolivar and Cabool are unreasonable to the extent that they exceed the Kansas City combination, and cites the commission's decision of Nov. 2, 1918, also on a complaint of the Kaw River Sand and Material Company, as the basis for his findings.

Coast Rock and Gravel Co. to Build Another Rock Crushing Plant

THE Coast Rock and Gravel Company, which operates a crushed rock plant at Piedra and asnd and gravel plants in other parts of the state, will start work immediately upon a new crushed rock plant in Tulare county, according to an announcement made yesterday by A. R. Kerstetter, district manager.

The new plant will be located at Roche, on the Suthern Pacific about seven miles north of Exeter and about seven miles east of Visalia, where the company has about 20 million yards of trap rock. The company will spend about a quarter of a million dollars in buildings and equipment, according to Kerstetter. It is expected that the plant will be in operation about February 1, 1925, and about 50 men wil be employed in its operation.

The initial crusher, known as a No. 15, will have a capacity of about 500 tons an hour.

The Roche plant will be operated in connection with the Piedra plant of the company and will be the company's second crushed rock plant. It will distribute its products principally in Tulare, Kings and Kern counties.

In addition to the Piedra and Roche plants, the Coast Rock and Gravel company operates sand and gravel plants at Fair Oaks, Oroville, Niles, Elliott, Marysville, Los Angeles and one at a point a short distance from Niles on the Western Pacific.

The general offices of the company are in San Francisco. The officers are, F. N. Woods, Jr., president; Frank W. Erlin, vice president; and J. W. Riley, sales manager. Kerstetter is district manager for the San Joaquin valley and maintains his office in Fresno.—*Fresno (Cal.) Republican.* L

Bath (Penn.) Portland Cement Company Lets Contract for New Plant

PUBLIC SERVICE PRODUCTION CO. has taken on a contract for construction of a cement mill at Sandt's Eddy, Penn., for the Bath Portland Cement Co. of Bath, Penn. The cost will be $1,500,000.

The contract is a blanket one, calling only for the construction of the mill with a capacity of 950,000 bbl. of cement annually. As soon as the site is turned over to the builder estimates and plans and specifications will be drawn up by it and it will act as architect, engineer, builder and millwright, turning over the completed mill. The spot is on the Delaware, six miles above Easton, and what is known as the wet process of cement manufacture will be installed. —*Newark (N. J.) Star-Eagle.*

J. R. Thoenen to Devote Time to Private Practice

J. R. THOENEN, mining engineer, has resigned as general manager of the Colorado Fluorspar Co., Cowdrey, Colo, and will devote his entire time to consulting work in the mining end of the rock products industry. His present address is 307 Riffel Ave., Greenville, Ohio.

New Missouri Sand and Gravel Plant Starts Production

THE Northeast Missouri Sand & Gravel Co., Inc., has completed one of the largest industries in this part of the county at a cost of over $40,000. They will start producing washed sand and gravel soon, employing 25 men.—*St. Louis Globe Democrat.*

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Buffalo, N. Y.	1.30 per net ton all sizes					
Chaumont, N. Y.	1.00	1.00	1.75	1.50	1.50	1.50
Cobleskill, N. Y.	1.35	1.35	1.25	1.25	1.25	
Coldwater, N. Y.	1.50 per net ton all sizes					
Columbia, Ill.	1.10	1.20	1.35	1.35	1.20	1.20
Eastern Pennsylvania	1.35	1.35	1.45	1.35	1.35	1.35
Munns, N. Y.	1.00	1.50	1.50	1.40	1.25	
Northern New Jersey			1.40	1.40	1.40	
Prospect, N. Y.	1.00	1.40	1.40	1.30	1.30	
Walford, Penn.		1.30b	1.30b	1.40b	1.40b	1.60c
Western New York	.85	1.25	1.25	1.25	1.25	1.25
CENTRAL						
Alton, Ill.	1.50		1.50	1.35		
Bloomville, Middlepoint, Dunkirk, Bellevue, Waterville, No. Baltimore, Holland, Kenton, New Paris, Ohio; Monroe, Mich.; Huntington, Bluffton, Ind.	1.00	1.10	1.10	1.10	1.00	1.00
Buffalo, Iowa	.90		1.25	1.05	1.10	1.10
Cypress, Ill.	1.25	1.30	1.25	1.25	1.25	1.15
Dundas, Ont.	.75	1.00	.90	.90	.90	.90
Greencastle, Ind.	1.25	1.25	1.05	1.05	1.05	1.05
Krause, Ill.	1.10	1.20	1.35	1.35	1.20	1.20
Lannon, Wis.	.80	1.00	1.00	.90		.90
Northern Wisconsin	.75		1.05	.95	.95	
St. Vincent de Paul, P. Q.	.75	1.25@1.45	1.10	1.00	1.00	1.00
Stone City, Iowa	.75			1.10@1.20	1.05	
Toronto, Canada	2.00‡	2.00‡	2.00‡	1.80‡	1.80‡	1.80‡
Valmeyer, Ill.	1.10	1.20	1.35	1.35	1.20	1.29
Waukesha, Wis.	1.15	1.15	1.15	1.15	1.15	1.15
Youngstown, Ohio				1.50	1.60	1.60
SOUTHERN:						
Alderson, W. Va.	.75	1.75	1.75	1.60	1.50	
Bridgeport and Chico, Texas	1.00§	1.35a	1.30a	1.25	1.25	1.10
Cartersville, Ga.	1.75	1.65	1.65	1.00	1.00	1.00
El Paso, Texas	1.00	1.00	1.00	1.00		
Graystone, Ala.	Crusher run with fines out, 1.00 per net ton					
Graysville, Ga.	1.00	1.00@1.25		.85@1.00	.85@1.00	
WESTERN:						
Atchison, Kans.	.50		2.00	2.00	2.00	1.60‖@2.00
Blue Spr'gs & Wymore, Neb.	.20	1.45	1.45	1.35@1.40	1.25@1.30	1.20
Cape Girardeau, Mo.	1.35		1.25	1.25	1.00	
Kansas City, Mo.	1.00	1.65	1.65	1.65	1.65	1.65

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Branford, Conn.	.60	1.60	1.35	1.15	1.00	
Cypress, Ill.	1.00@1.10					
Duluth, Minn.	1.00	2.25	1.90	1.50	1.35	1.35
Dwight, Calif.	1.75	1.75	1.75	1.75	1.75	
E. Summit, N. J.	1.50	2.00	1.80	1.40	1.40	
Eastern Maryland	1.10	1.75	1.70	1.60	1.50	1.50
Eastern Massachusetts	.85	1.75	1.75	1.25	1.25	1.25
Eastern New York	.75	1.25	1.25	1.25	1.25	1.25
Eastern Pennsylvania	1.10	1.75	1.70	1.60	1.50	1.50
Meriden, Middlefield, New Britain, Rocky Hill, Conn.	.60	1.60	1.35	1.15	1.00	1.00
Northern New Jersey	1.50	2.00	1.80	1.40	1.40	
Richmond, Calif.	.50*		1.50*	1.50*	1.50*	
San Diego, Calif.	.50@ .75	1.80@1.90	1.60@1.80	1.35@1.55	1.35@1.55	1.25@1.45
Springfield, N. J.	1.60	2.00	2.00	1.75	1.75	
Westfield, Mass.	.60	1.50	1.35	1.20	1.10	

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Berlin, Utley and Red Granite, Wis.	1.60	1.70	1.60	1.50	1.40	
Eastern Penn.—Sandstone	1.25	1.65	1.60	1.40	1.40	1.25
Eastern Penn.—Quartzite	1.20	1.35	1.20	1.20	1.20	1.20
Lithonia, Ga.—Granite	.75	1.60	1.60	1.25	1.25	1.10
Lohrville, Wis.	1.65	1.65@1.70	1.65	1.45	1.50	
Middlebrook, Mo.—Granite	3.00@3.50		2.00@2.50	2.00@2.25		1.25@2.00
Northern New Jersey (Basalt)	150	2.00	1.80	1.40	1.40	

* Cubic yd. †1 in. and less. ‡Prices include 90c freight. ‖Rip rap per ton. §Dust in. (a) Dust out; (b) less 5c 10 days; (c) less 10c 10 days (2¾" to ⅝").

Agricultural Limestone

(Pulverized)

Asheville, N. C.—Analysis, 57% $CaCO_3$, 39% $MgCO_3$; 50% thru 100 mesh; 200-lb. burlap bag, 4.00; bulk	2.75
Branchton, Penn.—100% thru 20 mesh; 60% thru 100 mesh; 45% thru 200 mesh. (Less 50 cents commission to dealers)	5.00
Bridgeport and Chico, Texas; bulk	5.50
Cartersville, Ga.—Pulverized limestone, all thru 10 mesh	1.75
30% thru 200 mesh	2.65
Chaumont, N. Y.—Pulverized limestone, bags, 4.00; bulk	2.50
Colton, Calif.—Analysis, 95% $CaCO_3$, 3% $MgCO_3$—all thru 20 mesh—bulk	4.00
Dundas, Ont., Can.—Analysis, 53.80% $CaCO_3$, 43.31% $MgCO_3$; 35% thru 100 mesh. 50% thru 50 mesh, 100% thru 10 mesh; bags, 4.75; bulk	3.00
Hillsville, Penn.—Analysis, 94% $CaCO_3$, 1.40% $MgCO_3$, 75% thru 100 mesh; sacks, $5.00; bulk	3.50
Jamesville, N. Y.—Analysis, 89.25% $CaCO_3$; 5.25% $MgCO_3$; pulverized, bags, 4.00; bulk	2.50
Knoxville, Tenn.—80% thru 100 mesh, bags, 3.95; bulk	2.70
Linville Falls, N. C.—Analysis, 57% $CaCO_3$, 39% $MgCO_3$; 50% thru 100 mesh; 200-lb. burlap bag, 4.00; bulk	2.75
Marblehead, Ohio—Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$; 60% thru 100 mesh; 70% thru 50 mesh; 100% thru 10 mesh; 80 lb. paper sacks, 5.00; bulk	3.50
Marion, Va.—Analysis, 90% $CaCO_3$, 2% $MgCO_3$; 42.5% thru 100 mesh, 11.3% thru 80, 20.2% thru 60, 22.8% thru 40, 3.2% thru 20 and under or 75% thru 40 mesh; pulverized, per ton	2.00
Mayville Wis.—59.8% thru 60 mesh	2.35
Mountville, Va.—Analysis 76.60% $CaCO_3$, 22.83% $MgCO_3$; 50% thru 100 mesh, 100% thru 20 mesh—125-lb. hemp bags	5.00
Osborne, Penn.—100% thru 20 mesh; 60% thru 100 mesh; 45% thru 200 mesh. (Less 50 cents commission to dealers)	5.00
Piqua, Ohio—Total neutralizing power 95.3%; 100% thru 10, 60% thru 50; 50% thru 100	2.10@ 2.25
100% thru 10, 90% thru 50, 80% thru 100; bags, 5.00; bulk	3.50
100% thru 100, 85% thru 200; bags, 7.00; bulk	5.50
Rockdale, Mass.—Analysis, 90% $CaCO_3$—50% thru 100 mesh; paper bags, 4.75; cloth, 5.25; bulk	3.25
West Stockbridge, Mass.—Analysis, 90% $CaCO_3$—50% thru 100 mesh; paper bags, 4.75; cloth, 5.25; bulk	3.25

Agricultural Limestone

(Crushed)

Alderson, W. Va.—Analysis, 90% $CaCO_3$; 50% thru 100 mesh	1.50
Alton, Ill.—Analysis 98% $CACO_3$; 50% thru 4 mesh	1.75
Bedford, Ind.—Analysis, 98½% $CACO_3$, ½% $MgCO_3$; 90% thru 10 mesh	1.50
Bettendorf, Iowa—97% $CaCO_3$, 2% $MgCO_3$; 50% thru 100 mesh; 50% thru 4 mesh	1.50
Blackwater, Mo.—95% $CaCO_3$; 100% thru 8 mesh	1.00
Bridgeport and Chico, Texas—90% thru 100 mesh; 50% thru 100 mesh; 90% thru 50 mesh, bulk	2.50
50% thru 50 mesh; 90% thru 4 mesh; 50% thru 4 mesh; bulk	1.50
Cape Girardeau, Mo.—Analysis, 93% $CaCO_3$, 3.5% $MgCO_3$; 90% thru 50 mesh	1.50

(Continued on next page)

Agricultural Limestone

(Continued from preceding page)

Carthage, Mo.—Analysis, 98½% $CaCO_3$; 100% thru 10 mesh, 30% thru 100 mesh	1.75
Cypress, Ill.—Analysis, 90 to 96% $CaCO_3$; 50% thru 100 mesh, 90% thru 50 mesh. 50% thru 50 mesh	1.90
Ft. Springs, W. Va.—Analysis, 90% $CaCO_3$; 50% thru 100 mesh	1.50
Kansas City, Mo.—50% thru 100 mesh	1.25
Krause, Columbia and Valmeyer, Ill.—Analysis, 90% $CaCO_3$; 90% thru 4 mesh	1.10
Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 99% through 10 mesh; 46% through 60 mesh	2.00
Screenings (¼ in. to dust)	1.00
Marblehead, Ohio.—Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$; 100% thru 4 mesh; 85% thru 10 mesh; 53% thru 50 mesh; 40% thru 100 mesh bulk	2.60
32% thru 100 mesh; 51% thru 50 mesh; 83% thru 10 mesh; 100% thru 4 mesh (meal) bulk	2.25
Middlepoint, Bellevue, Kenton, Ohio; Monroe, Mich.; Huntington and Bluffton, Ind.—Analysis, 52% $CaCO_3$, 44% $MgCO_3$; meal, 100% thru 4 mesh, 35% thru 100 mesh	.75@ 1.50
Milltown, Ind.—Analysis, 94.41% $CACO_3$, 2.95% $MgCO_3$; 30.8% thru 100 mesh .38% thru 50 mesh	1.45@ 1.60
Moline, Ill.—97% $CaCO_3$, 2% $MgCO_3$—50% thru 100 mesh; 50% thru 4 mesh	1.50
Pixley, Mo.—Analysis, 96% $CACO_3$; 50% thru 50 mesh	1.25
River Rouge, Mich.—Analysis, 54% $CaCO_3$, 40% $MgCO_3$; bulk	.80@ 1.40
Stone City, Iowa.—Analysis, 98% $CaCO_3$; 50% thru 50 mesh	.75

Pulverized Limestone for Coal Operators

Hillsville, Penn., sacks, 4.50; bulk	3.00

Miscellaneous Sands

Silica sand is quoted washed, dried and screened unless otherwise stated.

Glass Sand:

Berkeley Springs, W. Va	2.25@ 2.50
Cedarville, N. J.—Damp	1.75
Dry	2.25
Cheshire, Mass:	
6.00 to 7.00 per ton; bbl	2.50
Columbus, Ohio	1.50@ 1.75
Grays Summit and Klondike, Mo	2.00
Los Angeles, Calif.—20-70 mesh	5.00
Mapleton Depot, Penn.	2.25
Massillon, Ohio	3.00
Michigan City, Ind.	.50
Mineral Ridge, Ohio	2.50@ 3.00
Pacific, Mo.	2.25@ 3.00
Pittsburgh, Pa.—Dry	4.00
Damp	3.00
Ridgway, Pa.	2.50
Rockwood, Mich.	2.75@ 3.25
Round Top, Md.	2.25
San Francisco, Calif.	3.00@ 3.50
St. Louis, Mo.	1.50@ 3.00
South Vineland, N. J.—Damp	1.75
Dry	2.25
Thayers, Penn.	2.25@ 2.50
Utica, Ill.	1.25
Zanesville, Ohio	2.50

Foundry Sand:

Albany, N. Y.:	
Core	1.50
Molding fine, brass molding	2.25
Molding coarse	2.00
Sand blast	4.00
Arenzville, Ill.:	
Core	.75
Molding fine	1.40@ 1.60
Brass molding	1.75
Cheshire, Mass.—Furnace lining, molding fine and coarse	5.00
Sand blast	5.00@ 8.00
Stone sawing	6.00

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, f. o. b. producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
EASTERN:						
Attica, N. Y.	.75	.75	.85	.75	.75	.75
Buffalo, N. Y.	1.10	.95			.85	
Erie, Penn.		1.00*		1.50*	2.00*	
Farmingdale, N. J.	.58	.48	.85	1.10	1.10	
Franklinville, N. Y.	.75	.75	.85	.75	.75	.75
Leeds Jct., Maine		.50	1.75		1.35	1.25
Machias, N. Y.	.75	.75	.75	.75	.75	.75
Northern New Jersey		.50	1.25		1.25	1.25
Pittsburgh, Penn., and vicinity	1.25	1.25	1.00	1.00	.85	.85
Washington, D. C.—Rewashed, river	.85	.85	1.70	1.50	1.30	1.30
CENTRAL:						
Attica, Ind.	.75	.75	.75	.75	.75	.75
Barton, Wis.		.50@ .60			.60@ .70	.60@ .70
Columbus, Ohio	.75	.75	.85	.75	.75	.75
Covington, Ind.	.75	.75	.75	.75	.75	.75
Des Moines, Iowa	.50	.50	1.25	1.60	1.60	1.60
	Unwashed ballast, .50 a ton; washed, .75 (none screened)					
Eau Claire, Wis.	.40	.40	.85@1.25			.85
Elkhart Lake, Wis.	.50	.40	.50	.50	.50	.50
Ft. Dodge, Iowa	1.00		2.05	2.05	2.05	
Ft. Worth, Texas	2.00	2.00	2.00	2.00	2.00	2.00
Grand Rapids, Mich		.50		.80	.70	.70
Hamilton Ohio		1.00			1.00	
Hersey, Mich.		.50				.70
Indianapolis, Ind.	.60	.60		.90	.75@1.00	.75@1.00
Janesville, Wis.		.65@ .75			.65@ .75	
Mason City, Iowa	.45@ .55	.45@ .55	1.35@1.45	1.45@1.55	1.40@1.50	1.35@1.45
Mankato, Minn.		.50	1.35§		1.35	
Milwaukee, Wis.	1.01	1.01	1.21	1.21	1.21	1.21
Minneapolis, Minn.*	.65	2.50†	2.00§		2.00	1.75
Moline, Ill.	.60	.60	1.20	1.20	1.20	1.20
Palestine, Ill.	.75	.75	.75	.75	.75	.75
Riton, Wis.	.40	.20			.40	
St. Louis, Mo., f. o. b. cars	1.18	1.45	1.65§	1.45		1.45‖
Silverwood, Ind.	.75	.75	.75	.75	.75	.75
Summit Grove, Ind.	.75	.75	.75	.75	.75	.75
Terre Haute, Ind.	.75	.60	.75	.90	.90	.85
Waukesha, Wis.	.55	.55	.75	.75	.75	.75
Winona, Minn.	.40	.40	1.25	1.25	1.10	1.00
Yorkville, Sheridan, Oregon, Moronts, Ill.			Average .58 pit			
Zanesville, Ohio	.70	.60	.60	.60	.90	.90
SOUTHERN:						
Brookhaven, Miss., Roseland La.		.50	1.35			
Charleston, W. Va	all sand 1.52 f.o.b. cars		all gravel 1.63 f.o.b. cars			
Chehaw, Ala.	1.24	1.24		1.90	1.90	1.90
Estill Springs, Tenn.	1.00	.90			.85	.85
Knoxville, Tenn.	1.00	1.00	1.20	1.20	1.20	1.20
Macon, Ga.	.50	.50		.75	.75	.75
New Martinsville, W. Va.	1.00	.90		1.20		.90
WESTERN:						
Baldwin Park, Calif.		.25@ .35			.50@ .75	
Crushed rock	.90@1.10	.60@ .90	.60@ .90	.60@ .90	.60@ .90	
Kansas City, Mo.		Kaw river sand .75 per ton f.o.b. plants				
Los Angeles, Calif.	1.00*	1.00*	1.50*	1.50*	1.40*	1.40*
Pueblo, Colo.	1.10*	.90*		1.60*		1.50*
San Diego, Calif.	50@ .65	.80@ .90	1.40@1.50	1.20@1.30	1.00@1.10	1.00@1.10
Seattle, Wash. (bunkers)	1.50*	1.50*	1.50*	1.50*	1.50*	1.50*
Webb City, Mo.	.75	.75	.25@ .75b	.85b	1.25c	1.15c

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel ½ in. and less	Gravel. 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
Boonville, N. Y.	.60@ .80		.55@ .75			1.00
Brookhaven, Miss., Rosel'd, La.	.75	.50			1.25	
Chehaw, Ala.	.90@1.00					
Dudley, Ky.‡	1.05	1.05		.95		
East Hartford, Conn.			Sand, .65 per cu. yd.			
Elkhart Lake, Wis.	.50					
Gainesville, Texas		.95				.55
Grand Rapids, Mich.				.55		
Hamilton, Ohio					.70	
Hersey, Mich.				.55		
Indianapolis, Ind.		Mixed gravel for concrete work, .65				
Lindsay, Texas						.55
Macon, Ga.	.35					
Mankato, Minn.			Pit run gravel, .60			
Moline, Ill.	60	.60	Concrete gravel, 50% G., 50% S., 1.00			
Montezuma, Ind.						.60
St. Louis, Mo.		Mine run gravel 1.55 per ton				
Summit Grove, Ind.	.50	.50	.50	.50	.50	.50
Waukesha, Wis.	.60	.60	.60	.60	.60	.60
Winona, Minn.	.60					
Zanesville, Ohio	.60	.60				

*Cubic yd.; †roofing gravel; §⅝ in. and less; ‡crushed rock; ‖2½ in. and less; (a) ¾ in. and less; (b) flint chats; (c) crushed flint.

Miscellaneous Sands

(Continued from preceding page)

Columbus, Ohio:	
Core	.25@ .35
Furnace lining	2.00@ 2.50
Molding fine	1.50@ 2.00
Molding coarse	1.50@ 1.75
Sand blast	3.50@ 5.00
Stone sawing	1.50
Traction	.25@ 1.00
Brass molding	2.00
Dresden, Ohio:	
Core	1.25
Furnace lining, brass molding	1.50
Molding fine and coarse	1.25@ 1.50
Traction	1.00
Dunbar, Penn.:	
Traction (damp)	2.00
Eau Claire, Wis.:	
Roofing sand	3.25@ 4.25
Sand blast	3.25
Core	1.25
Elco, Ill.:	
Ground silica per ton in carloads	20.00@31.00
Grays Summit, Mo.:	
Molding fine	1.75@ 2.00
Kasota, Minn.:	
Stone sawing	1.25
Klondike, Mo.:	
Molding fine	1.75@ 2.00
Los Angeles, Calif.:	
Roofing sand—stucco material, 8-12 and 12-20 mesh	6.00
Mapleton Depot, Penn.:	
Molding fine	2.25
Traction	2.00
Massillon, Ohio:	
Molding fine, coarse, furnace lining and core, traction	2.50
Michigan City, Ind.:	
Core	.50@ .55
Traction	.40
Mineral Ridge and Ohlton, Ohio:	
Furnace lining, molding fine (both green)	1.75
Molding coarse, roofing sand, sand blast, stone sawing, traction (all green)	2.00
Montoursville, Penn.:	
Core	1.25@ 1.50
Traction	1.25
New Lexington, Ohio:	
Molding fine	2.00
Molding coarse	1.50
Ottawa, Ill.:	
Crude silica sand	.75@ .85
Core, furnace lining, steel molding	1.50
Roofing sand	1.50@ 4.50
Sand blast	4.50
Pacific, Mo.:	
Core, furnace lining	1.00@ 1.25
Molding fine	.90@ 1.00
Stone sawing	1.00@ 1.75
Molding coarse	.85@ 1.00
Ridgway, Penn.:	
Core	2.00
Furnace lining, molding fine, molding coarse	1.25
Traction	2.25
Round Top, Md.:	
Core	1.60
Building sand	1.00
Traction	1.75
St. Louis, Mo.:	
Core	1.00@ 1.75
Furnace lining	1.50
Molding fine	1.50@ 2.50
Molding coarse	1.25@ 1.75
Roofing sand	1.75
Sand blast	3.50@ 4.50
Stone sawing	1.25@ 2.25
Traction	1.25
Brass molding	2.00@ 3.00
San Francisco, Calif.:	
(Washed and dried)—Core, molding fine, roofing sand and brass molding	3.00@ 3.50

Crushed Slag

City or shipping point	Roofing	¼ in. down	½ in. and less	¾ in. and less	1½ in. and less	2½ in. and less	3 in. and larger
EASTERN:							
Buffalo, N. Y.	2.25	1.25	1.25	1.25	1.25	1.25	1.25
E. Canaan, Conn.	3.00	1.00	2.25	1.25	1.25	1.15	1.15
Eastern Penn. and Northern N. J.	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Reading, Pa.	2.50	1.00		1.25			
Western Penn.	2.50	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Ironton, Ohio	2.05	1.45		1.45	1.45	1.45	
Jackson, Ohio		1.30		1.30	1.30	1.30	
Toledo, Ohio	1.50	1.25	1.25	1.25	1.25	1.25	1.25
Youngstown, Dover, Hubbard, Leetonia, Struthers, O.	2.00	1.25	1.35	1.35	1.25	1.25	1.25
SOUTHERN:							
Ashland, Ky.		1.55		1.55	1.55	1.55	
Ensley and Alabama City, Ala.	2.05	.80	1.25	1.15	.90	.90	.80
Longdale, Goshen, Glen Wilton, Roanoke, Ruesens, Va.	2.50	1.00	1.25	1.25	1.25	1.15	1.15

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime, Blk.	Ground burnt lime, Bags	Lump lime, Blk.	Lump lime, Bbl.
EASTERN:								
Berkeley, R. I.			12.00					2.30
Buffalo, N. Y.				12.00				
Lime Ridge, Penn.							5.00a	
Williamsport, Penn.			10.00				6.00	
York, Penn.		10.50	10.50	11.50			8.50	1.65i
CENTRAL:								
Cold Springs, Ohio		9.50	9.50		9.00	11.00	9.00	
Delaware, Ohio	12.50	10.00	9.00	10.50			9.00	1.60
Gibsonburg, Ohio	12.50		9.50		9.00	11.00	9.00	
Huntington, Ind.		9.50	9.50		9.00		8.50	1.50b
Luckey, Ohio	12.50							
Marblehead, Ohio		9.50	9.50				8.50	1.50c
Marion, Ohio		9.50	9.50				8.50	1.70j
Mitchell, Ind.		12.00	12.00	12.00	11.00		10.00	1.70e
Tiffin, Ohio					9.00			
White Rock, Ohio	12.50				9.00	11.00		
Woodville, Ohio	12.50†	9.50†	8.50†		9.00		9.00	1.60
SOUTHERN:								
Erin, Tenn.							8.50	1.40*
El Paso, Texas							14.00	2.00
Graystone, Ala.	12.50	11.00		11.00			8.50	1.50k
Karo, Va.		10.50	9.00				7.00g	1.65h
Knoxville, Tenn.	22.00	11.00		11.00			8.50	1.50
Staunton, Va. (boss lime)								1.30
Varnons, Ala. (f)	11.00	11.00	11.00	11.00	9.00	11.00	8.50	15.00
Zuber and Ocala, Fla.	14.00	12.00	10.00				11.00	1.60
WESTERN:								
Kirtland, N. M.							12.50h	
San Francisco, Calif.	22.00	22.00	15.00	22.00				2.50
Tehachapi, Calif.							13.00	2.00d

*And 1.50; †50-lb. paper bags; (a) F. O. B. Kilns; (b) wooden bbl.; (c) wooden, steel 1.70; (d) to 2.15; (e) 180-lb. wooden bbl.; (f) dealers' prices; (g) to 9.50; (h) to 1.75; (i) 200 lb. bbl.; 2.65, 300 lb. bbl.; (j) steel; (k) jute bags, 1.35.

Miscellaneous Sands

(Continued)

San Francisco, Calif. (Direct from Pit)	
Furnace lining, molding coarse, sand blast	3.60
Stone sawing, traction	2.30
Tamalco, Ill.:	
Molding coarse	1.40@ 1.60
Brass molding	1.75
Tamms, Ill.:	
Ground silica per ton in carloads	20.00@31.00
Thayers, Penn.:	
Core	1.90
Molding fine and coarse	1.25
Traction	2.25
Utica, Ill.:	
Core, furnace lining, molding fine and coarse	.60@ 1.25
Roofing sand, traction	1.25
Sand blast	2.50
Stone sawing	1.25@ 2.50
Brass molding	.75@ 1.25
Warwick, Ohio.:	
Core, molding fine and coarse (all green) 1.75; all dry	2.50
Traction	2.50
Furnace lining (green)	1.75
Zanesville, Ohio:	
Sand blast, core, traction	2.50
Molding fine	2.00
Molding coarse	1.50
Furnace lining	2.25
Brass molding	2.00

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point.

Baltimore, Md.:	
Crude talc (mine run)	**3.00@ 4.00**
Ground talc (20-50 mesh), bags	**10.00**
Cubes	**55.00**
Blanks (per lb.)	**.08**
Pencils and steel workers' crayons, per gross	1.25
Chatsworth, Ga.:	
Crude (for grinding)	6.00
Ground (150-200 mesh, bags)	12.00
Pencils and steel workers' crayons	1.25@ 2.50
Chester, Vt.:	
Crude	5.00
Ground (20-50 mesh) bags extra	7.00@ 8.00
Ground (150-200 mesh) bags extra	8.00@10.00
E. Granville, Rochester, Johnson, Waterbury, Vt.:	
Ground talc (20-50 mesh) bags	7.00@10.00
Ground talc (150-200 mesh) bags	10.00@25.00
Pencils and steel workers' crayons, per gross	.75@ 2.00
Emeryville, N. Y.:	
(Double air floated) including bags; 200 mesh, 13.75; 325 mesh	14.75
Hailesboro, N. Y.:	
Ground (150-200 mesh) bags	18.00
Henry, Va.:	
Crude talc (mine run) per 2000-lb. ton	3.00@ 4.00
Ground (150-200 mesh), bags	8.50@15.00
Joliet, Ill.	
Ground (150-200 mesh) bags	28.00@30.00
Keeler, Calif.:	
(150-200 mesh); carloads, 30 tons or more (bags extra)	20.00@30.00
Marshall, N. C.:	
Crude	4.00@ 8.00
Ground (20-50 mesh), bags extra	6.50@ 8.50
Ground (150-200 mesh), bags	8.00@12.00
Natural Bridge, N. Y.:	
Ground talc (300-325 mesh), 200-lb. bags	13.00@15.00

Rock Phosphate

Prices given are per ton (2240-lb.) f.o.b. producing plant or nearest shipping point.

Lump Rock

Centerville, Tenn.—B.P.L. 65%, bags	**8.50**
Bulk	**6.50**
Gordonsburg, Tenn.—B.P.L. 65-70%	4.00@ 5.00
Mt. Pleasant, Tenn.—B.P.L. 72%	5.50@ 6.00
13% phosphoric acid, 95% thru 80 mesh	5.75
75% hand mined	6.50@ 6.75
75% washed over ¼-in. screen	6.75
78% max. 4½% I and A	8.00
Tennessee—F. O. B. mines, gross ton, unground Tenn. brown rock, 72% min. B.P.L.	**5.50**
Twomey, Tenn.—B.P.L. 65%	7.00@ 8.00

(Continued on next page)

Roofing Slate

The following prices are per square (100 sq. ft.) for Pennsylvania Blue-Clay Roofing Slate, f. o. b. cars quarries:

Sizes	Genuine Bangor, Washington Big Bed, Franklin Big Bed	Genuine Albion	Slatington Small Bed	Genuine Bangor Ribbon
24x12	$10.20	$10.00	$8.10	$7.80
24x14	10.20	10.00	8.10	7.80
22x12	10.80	10.00	8.40	8.75
22x11	10.80	10.50	8.40	8.75
20x12	12.60	10.50	8.70	8.75
20x10	12 60	11.00	8.70	8.75
18x10	12.60	11.00	8.70	8.75
18x 9	12.60	11.00	8.70	8.75
16x10	12.60	11.00	8.40	8.75
16x 9	12.60	11.00	8.40	8.75
16x 8	12.60	11.00	8.40	8.75
18x12	12.60	11.00	8.70	8.75
16x12	12 60	11.00	8.40	8.75
14x10	11.10	11.00	8.10	7.80
14x 8	11.10	10.50	8.10	7.80
14x 7 to 12x6	9.30	10.50	7.50	7.80
	Mediums	Mediums	Mediums	Mediums
24x12	$ 8.10	$8.10	$7.20	$5.75
22x11	8.40	8.40	7.50	5.75
Other sizes	8.70	8.70	7.80	5.75

For less than carload lots of 20 squares or under, 10% additional charge will be made.

(Continued from preceding page)

Ground Rock

Mt. Pleasant, Tenn. — B.P.L. 65%, 2000 lb.		7.00
Twomey, Tenn.—B.P.L. 65%	7.00@	8.00

Florida Soft Phosphate

(Raw Land Pebble)

Per Ton

Florida—F. O. B. mines, gross ton, 68/66% B.P.L.	2.25
70% min. B.P.L.	2.50
72% min. B.P.L.	2.75
75/74% B.P.L.	3.75

Fluorspar

Fluorspar—80% and over calcium fluoride, not over 5% silica; per ton f.o.b. Illinois and Kentucky mines	18.00@19.00
Fluorspar—85% and over calcium fluoride, not over 5% silica; per ton f.o.b. Illinois and Kentucky mines	19.00@20.00

Special Aggregates

Prices are per ton f. o. b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco chips
Barton, Wis., f.o.b. cars		10.50
Chicago, Ill.—Stucco chips, in sacks f.o.b. quarries		17.50
Crown Point, N. Y. — Mica Spar		7.00@ 8.00
Easton, Penn.—Slate granules		7.00@ 7.50
Haddam, Conn. — Felstone buff	12.00	12.00
Harrisonburg, Va.—Blk. marble (crushed, in bags	14.50@22.50	14.50@22.50
Ingomar, Ohio (in bags)		6.00@25.00
Middlebrook, Mo.—Red		25.00@30.00
Milwaukee, Wis.		14.00@34.00
Newark, N. J.—Roofing granules		7.50
New York, N. Y.—Red and yellow Verona		32.00
Poultney, Vt., 2000 lb.		6.12
Phillipsburg, N. J.— Evergreen, bulk	8.00@10.00	8.00@10.00
Creme and royal, bulk	15.00@20.00	15.00@20.00
Red Granite, Wis.		7.50
Sioux Falls, S. D.	7.50	7.50
Stockton, Cal.—Crushed quartz, red rock, greenstone, jasper, sacks		*10.00
Tuckahoe, N. Y.— 2000 lb.		12.00@20.00
Wauwatosa, Wis.		16.00@34.00
Whitestone, Ga.—White marble chips, net ton in bulk, f.o.b. cars, granite	4.50@ 6.00	4.50@ 6.00

*LCL, 10% higher.

Concrete Brick

Prices given per 1000 brick, f.o.b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	20.00@22.00	25.00@35.00
Baltimore, Md.	15.00	24.00
Ensley, Ala. ("Slag-tex")	12.50	22.50@33.50
Eugene, Ore.	25.00	35.00@75.00
Friesland, Wis.	22.00	32.00
Omaha, Neb.	18.00	30.00@40.00
Philadelphia, Penn.	15.75	21.50
Portland, Ore. (del. loc.)	21.00	30.00@100.00
Prairie du Chien, Wis.	14.00	21.50@30.00
Puyallup, Wash.	20.00	30.00@90.00
Rapid City, S. D.	18.00	25.00@40.00
Salem, Ore.	23.00	50.00
Seattle, Wash.	22.00	40.00
Wauwatosa, Wis.	14.00@18.00	30.00@42.00
Winnipeg, Can.	15.50	

Sand-Lime Brick

Prices given per 1000 brick f. o. b. plant or nearest shipping point, unless otherwise noted.

Barton, Wis.	10.50
Boston, Mass.	15.00@16.50
Dayton, Ohio	12.50@13.50
Grand Rapids, Mich.	11.00
Jackson, Mich.	13.00
Lancaster, N. Y.	13.00
Michigan City, Ind.	11.00
Milwaukee, Wis. (delivered)	13.00
Plant City, Fla.	10.00@11.00
Portage, Wis.	15.00
Rochester, N. Y.	19.75
Saginaw, Mich.	12.00

San Antonio, Tex.	12.50@13.50
Syracuse, N. Y. (delivered at job)	20.00
F.o.b. cars	18.00

Gray Klinker Brick

El Paso, Texas	13.00

Lime

Warehouse prices, carload lots at principal cities.

	Hydrated, Finishing	per ton Common
Atlanta, Ga.	22.50	14.00
Baltimore, Md.	24.25	17.85
Cincinnati, Ohio	16.80	14.30
Chicago, Ill.	20.00	20.00
Dallas, Tex.	20.00	——
Denver, Colo.	24.00	——
Detroit, Mich.	22.00	20.00
Minneapolis, Minn. (white)	25.50	21.00
Montreal, Que.	21.00	21.00
New York, N. Y.	18.20	13.10
St. Louis, Mo.	24.00	20.00
San Francisco, Calif.	22.60	22.60
Seattle, Wash. (paper sacks)	24.00	——

Portland Cement

Prices per bbl. and per bag net in carload lots.

	Per Bag	Per Bbl.
Albany, N. Y.	....	2.62
Atlanta, Ga.	....	2.35
Boston, Mass.	....	2.63@3.03†
Buffalo, N. Y.	....	2.48@2.88†
Cedar Rapids, Iowa	.60	2.44
Cincinnati, Ohio	.61¾	2.47
Cleveland, Ohio	.59¾	2.39
Chicago, Ill.	.55	2.20
Columbus, Ohio	....	2.44
Dallas, Texas	.53¾	1.85
Davenport, Iowa	.59¾	2.39
Dayton, Ohio	....	2.48
Denver, Colo.	.63¾	2.55
Detroit, Mich.	.60	2.40
Duluth, Minn.	.54¾	2.19
Indianapolis, Ind.	.60¼	2.41
Kansas City, Mo.	.54¼	2.37
Los Angeles, Cal. (less 5c dis.)	.65	3.08
Memphis, Tenn.	....	2.60
Milwaukee, Wis.	.58¾	2.35
Minneapolis, Minn.	.60½	2.42
Montreal, Canada (sks. 20c ext.)	....	1.90b
New Orleans, La.	....	2.40
New York, N. Y.	....	2.25@2.65†
Philadelphia, Penn.	....	2.41@2.81†
Phoenix, Ariz.	.82½	3.30
Pittsburgh, Penn.	.54¾	2.19
Portland, Ore.	....	3.05
San Francisco, Cal.	....	2.61*
St. Louis, Mo.	.57½	2.30
St. Paul, Minn.	.60½	2.42
Seattle, Wash. (10c bbl. dis.)	....	2.90
Toledo, Ohio	.61¼	2.45

NOTE—Add 40c per bbl. for bags.
*5c cash disc. 10 days.
†Prices to contractors, including bags.
(b) Less 10c 20 days.

Mill prices f. o. b. in Carload Lots to Contractors

	Per Bag	Per Bbl.
Buffington, Ind.	.48¾	1.95
Concrete, Wash.	....	2.60
Dallas, Texas	....	2.05
El Paso, Tex.	.70	2.08*
Hannibal, Mo.	....	2.05
Hudson, N. Y.	....	2.05
Leeds, Ala.	....	1.95
Los Angeles, Calif.	....	2.65
Louisville, Ky.	....	2.35
Northampton, Penn.	....	1.95
Phoenix, Ariz.	....	4.30†
Steelton, Minn.	.50	2.00
Universal, Penn.	.48¾	1.95

*Gross, 10c sacks and 10c per bbl. disc 10 days.
†Gross, 15c sacks and 5c per bbl. disc. 10 days.

Gypsum Products—CARLOAD PRICES PER TON AND PER M SQUARE FEET, F. O. B. MILL

	Crushed Rock	Ground Gypsum	Agri-cultural Gypsum	Stucco Calcined Gypsum	Cement and Gauging Plaster	Wood Fiber	White Gauging	Sanded Plaster	Keene's Cement	Trowel Finish	Plaster Board ¼x32x36" Weight 1500 lb. Per M Sq. Ft.	Plaster Board ⅜x32x36" Weight 1850 lb. Per M Sq. Ft.	Wallboard, ⅜x32 or 48" Lengths 6'-10', 1850 lb. Per M Sq. Ft.
Agatite, Texas (a)	....	....	6.00	10.00	10.00	10.50	10.00	....	19.00	....	....	....	....
Akron, N. Y. (a)	3.00	4.00	6.00	10.00	10.00	10.00	20.20	7.00@9.00	27.35	21.00	19.375	20.00	30.00@32.00
Black Hawk, S. D.	3.50	....	7.00	10.00	10.00	10.50	....	....	....	....	....	....	....
Blue Rapids, Kans. (a)	2.50	4.00	6.00	10.00	10.00	10.50	10.00	....	23.15	19.00	19.375	20.00	....
Denver, Colo.	....	....	....	11.80	....	....	....	....	....	....	....	....	....
Douglas, Ariz.	....	....	6.00	....	15.00	....	....	....	....	15.50	....	....	....
Ft. Dodge, Iowa (a)	2.50	4.00	6.00	10.00	10.00	10.50	15.45	....	22.70	20.00	19.375	20.00	30.00
Grand Rapids, Mich.	2.75	....	6.00	10.00	10.00	10.00	....	....	....	....	....	....	....
Gypsum, Ohio (a)	2.75	4.00	6.00	10.00	10.00	10.00	19.25	7.50	26.85	19.00	19.375	20.00	30.00
Port Clinton, Ohio	3.00	4.00	6.00	8.00	10.00	10.00	....	7.50	30.15	20.00	....	20.00	30.00
Portland, Colo.	....	....	....	10.00	....	....	....	....	....	....	....	....	....
San Francisco, Calif.	....	....	....	15.40*	....	....	....	....	....	....	....	....	....
Winnipeg, Man.	5.50	5.50	7.00	13.50	15.00	15.00	....	....	....	....	28.50	....	35.00

NOTE—Returnable Bags, 10c each; Paper Bags $1.50 per ton extra (not returnable).
*Including sacks at 15c each; (a) prices are net of bags.

New Machinery and Equipment

The Schulthess Lime Hydrator to Be Made in the U. S. A.

THE McGann Manufacturing Co., York, Penn., has obtained the rights to manufacture and sell in this country, Cuba, Porto Rico and South America the Schulthess lime hydrator, the patents for which are owned and controlled by Spoerri & Co., Zurich, Switzerland. This machine has been on the market abroad for the past ten years and has been quite extensively employed in lime plants in various European countries.

The Schulthess hydrator is a continuous hydrator. In this hydrator the first and most particular feature of its operation is that no crusher is needed to crush the lime as it comes from the kilns. In the Schulthess hydrator the lime is taken just as it comes from the kilns and the slaking and hydrating process are begun at once. The second feature is the elimination of the dust nuisance.

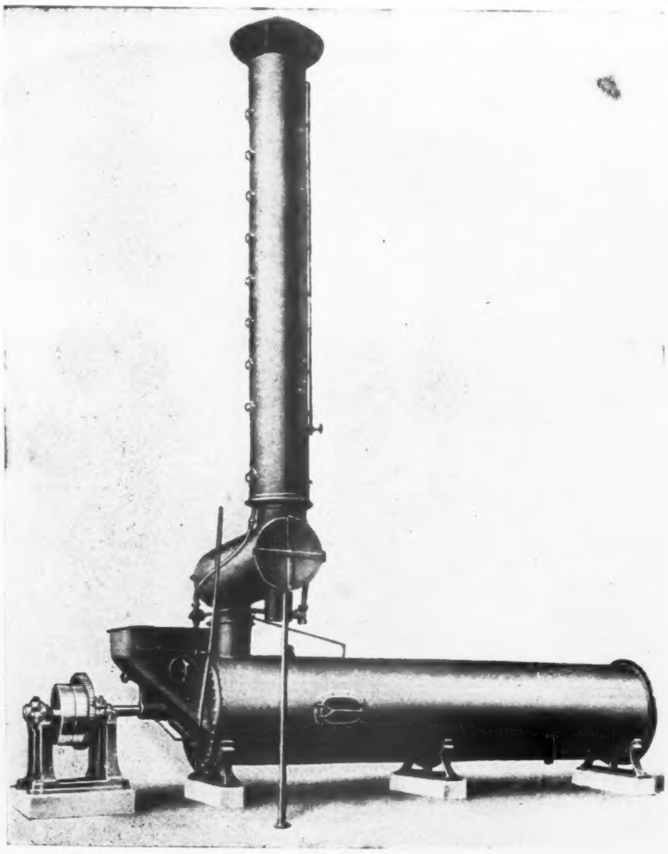
The Schulthess lime hydrator is arranged for use in three ways:

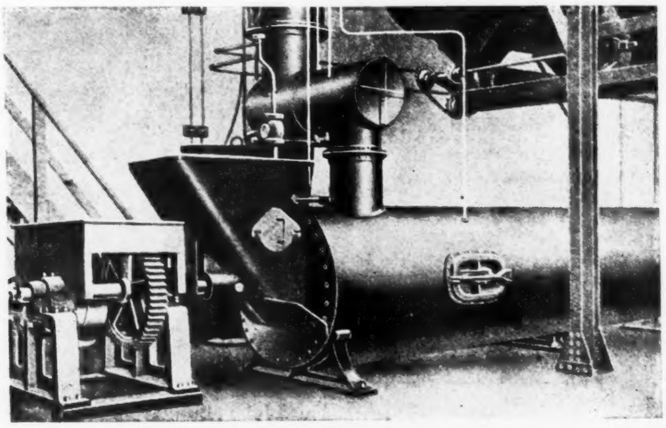
1. When the hydrate may be mixed with a small quantity of foreign matter, such as sand, lime, ash, unburned limestone in the form of fine powder discharged from the sifting machine, ground and again added to the hydrate, as is done in the manufacture of hydraulic limes, and limes for mortar:

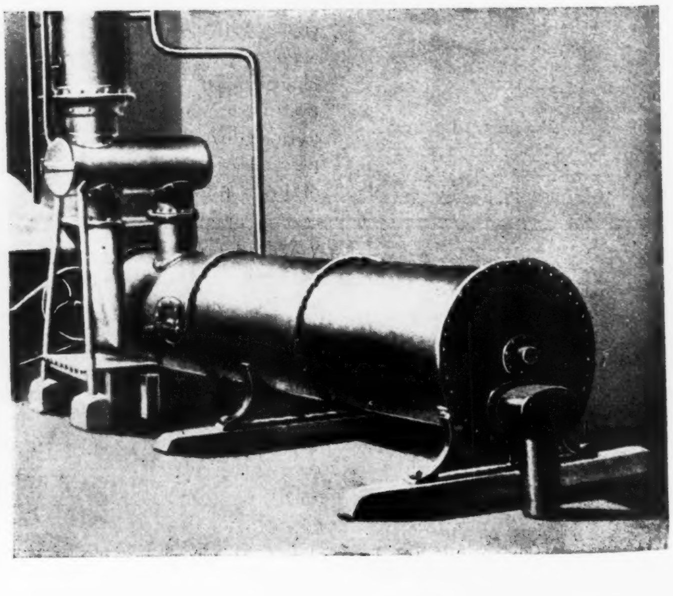
The lime coming from the kiln is fed to the slaking machine in the size in which it comes from the kiln without any crushing whatever, the hydrate from the slaker is carried to a tank by means of an elevator (the tank is of sufficient size to hold three days' supply) from the tank the hydrate is carried by means of an automatic feeder into the elevator, which in its turn empties into an air separator. On the one side, the finished hydrate falls from the air separator and is carried to sacks, barrels or any other container, while on the other side, the discharge falls, which in a gritty form contains all the foreign matter. These small particles of unburned or overburned lime, sand, small stones, pieces of coal, etc., coming from the kilns are carried to a pulverizer. These foreign substances, now ground to the finest powder (usually about 5% of the total quantity fed to the hydrator) are again carried to the tank and come again into the elevator and are there mixed with the hydrate coming into the air separator.

2. In this instance the hydrate is free from foreign matter and the pulverizer is, therefore, not needed. The process in this case is as follows:

The lime just as it comes from the kilns is dumped into an elevator which raises it into a tank; the lime is carried into the slaking machine by an automatic feeder; the hydrate falling from the lime slaking machine is carried to the storage tanks from which it is taken later and given over to the air separator; the hydrate falling from the air separator is packed into sacks, etc., or transported for the purpose for which it is to be used, while the discharge—that is, the foreign matter contained in the lime—is eliminated. If the hydrate is to be used for chemical purposes, this method may be used,



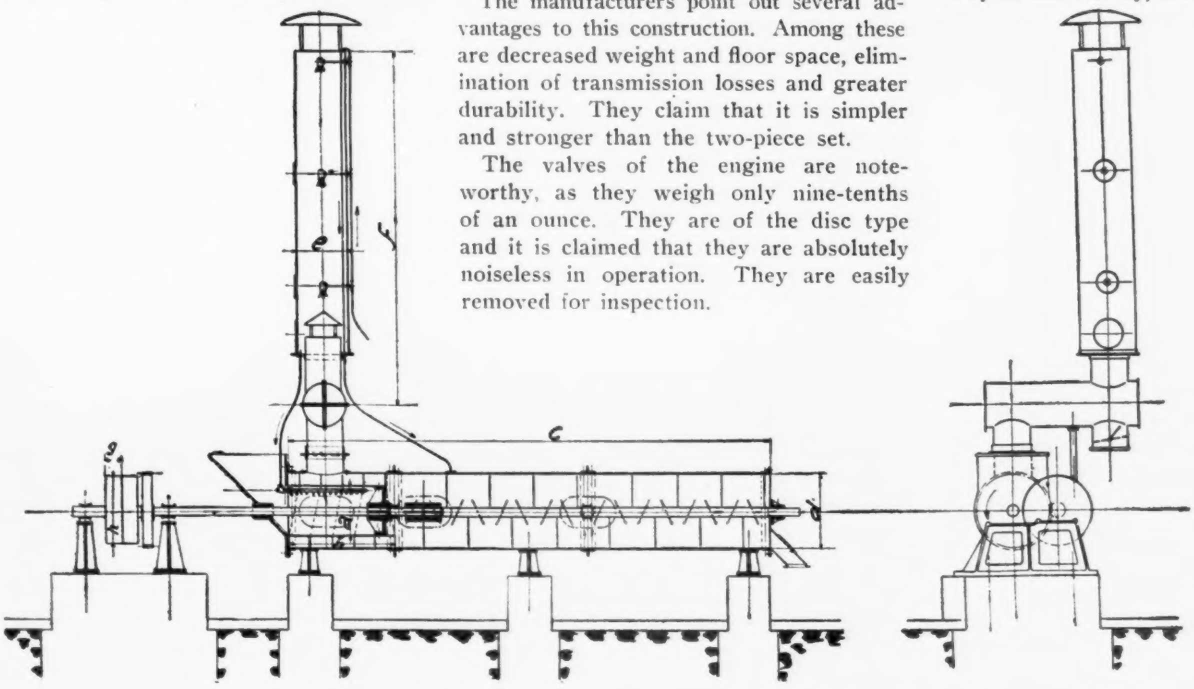




Three views of the Schulthess hydrator which has been extensively employed during the last ten years in the European lime industry and is now to be placed on the market in the United States. It may be used in three different ways according to the use to which the hydrate obtained is to be put

as in such a case, no foreign matter can be allowed even if it is ground to a fine powder.

3. In the third method, used in chemical factories, the requirement is that the hydrate must arrive as quickly as possible in the end tank for which an intermediate cooling becomes necessary. The hydrate falling from the hydrator has a temperature of about 50 to 60 deg. C. Therefore a cooling conveyor is fitted between the slaking machine and the air separator, which serves to cool the hydrate quickly. The construction of this cooling conveyor is in the form of a double wall which can be mounted, according to local conditions, either above, behind, below or beside the hydrator. A counter stream of cooling water is carried through the cooling space, and this produces a rapid cooling process; the water is used over and over. This arrangement is particularly used in plants which produce chloride of lime. The discharge from the air separator is carried away and only the pure hydrate of lime carried to the storage tank.



Detail of the operating mechanism of the Schulthess lime hydrator

The American manufacturers state: "The rights to manufacture and sell the Schulthess machine were procured by us to provide an automatic continuous hydrator of smaller size than the Schaffer automatic hydrator, Schulthess machines being made in six different sizes from ½ to 5 tons per hour"

New Grease Cup

A GREASE CUP is a small matter in a plant or factory, but it can be a nuisance and a cause of expense far out of proportion to the cost of the cup. Recognizing this, the Link-Belt Co. of Indianapolis has developed a new top for their regular compression grease cup. This top is hexagonal in shape, which provides not only a good grip for the hand but one for a wrench. Cold, stiff grease makes a compression cup very hard to turn, and a pipe wrench is not always accessible. The hexagonal shape provides grip spaces for the ordinary wrench. Also, this cup is provided with a raised slot so that the cup can be turned with a screw driver, when it is so located that it is inconvenient for the hand or wrench. The new cup, known as the Hex-Top grease cup, is absolutely grease tight, according to the manufacturer.

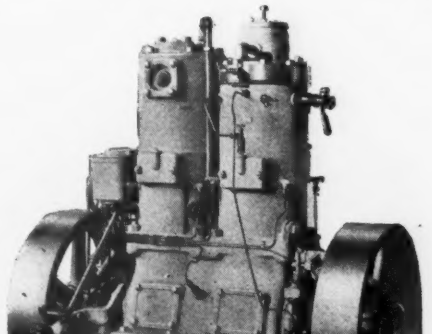
Charter-Mietz Air Compressor Engine

THE Charter-Mietz air compressor engine has been given a very compact and substantial construction by mounting the engine cylinder and the air compressor cylinder on the same base.

The manufacturers point out several advantages to this construction. Among these are decreased weight and floor space, elimination of transmission losses and greater durability. They claim that it is simpler and stronger than the two-piece set.

The valves of the engine are noteworthy, as they weigh only nine-tenths of an ounce. They are of the disc type and it is claimed that they are absolutely noiseless in operation. They are easily removed for inspection.

In the design of this engine clearance space has been reduced to a minimum, thus reducing clearance losses.



Charter-Mietz air compressor engine

The engine compressor is built in a number of different sizes and for pressures up to 200 lb. per square inch by the Charter Gas Engine Co. of Sterling, Ill. The machine is extensively used by the United States lighthouse service.

Find Semi-Precious Stones in Gravel Deposit

FIFTY acres of gravel, said to contain some precious stones, including topaz, agate and moonstone, have been discovered about six miles south of Wichita Kansas, on the L. A. Bone farm. L. E. Bone, a son of the discoverer, has received several of the stones, polished and mounted, which were sent here from San Francisco by the elder Mr. Bone, according to local papers.

Several months ago the gravel bed, a rarity in this vicinity, was discovered. Tests were made which indicated that the gravel underlaid the entire 50-acre farm. The bed is known to be at least 50 ft. deep and the end of the strata never has been found.

While investigating the gravel bed the owner discovered many various colored stones of unusual hardness. A steel file failed to scratch their surface. Bone went to California and placed the stones in the hands of a jewel cutting firm, and they were pronounced of unusual hardness and luster.

Steps will be taken to commercialize the gravel deposit, which possesses considerable value. The stones also will be marketed.

[There is nothing unusual about the occurrence of agate, moonstone and (more rarely) garnet and topaz in gravel deposits. Many good specimens of these have come from river gravels found west of the Mississippi, but they are rarely of commercial importance.—Ed.]

News of All the Industry

Incorporations

Tennessee-Arkansas Gravel Co., Arkansas City, Ark., has been incorporated for $100,000.

Cement and Gun Co., St. Louis, Mo., has been incorporated for $10,000. B. C. Collier, president; J. Mair, secretary.

Dennis Concrete Products Co., Detroit, Mich., has been incorporated for $60,000 and 600 shares of no par value.

Carolina Duntile Co., Kinston, N. C., has been incorporated for $50,000 by L. L. Mallard, M. L. Shealy, and others.

Columbus Gravel Co., Columbus, Texas, has been incorporated for $20,000 by L. T. Everett, E. C. Miller, and J. J. Everett.

Rontsen Supply Co., Flint, Mich., has been incorporated for $50,000 to handle concrete products and other building material.

Atlas Cement Tile Co., New Orleans, La., has been incorporated for $20,000 by Fabian W. Birie, W. J. Foley, and others.

Florence Concrete Products Co., Florence, Ala., has been incorporated by Joseph L. Buffler, E. G. Morris, Sr., and W. A. Macke.

Williamette Sand and Gravel Co., Portland, Ore., has been incorporated for $50,000 by C. A. Puariea, H. F. Puariea, and Lloyd Bates.

Southern Granite Co., Wilmington, Del., has been incorporated for $500,000 by M. M. Lucey, M. B. Reese, and L. S. Dorsey, Wilmington.

New Haven Sand and Gravel Co., Hartford, Conn., has been incorporated for $50,000 by Samuel A. Lewis, George F. MacLean, and Flora L. Adam.

Lufkin Concrete Brick and Tile Co., Lufkin, Texas, has been incorporated for $10,000 by Mrs. G. H. Cummings, D. M. Filler, and Mrs. Hazel C. Filler.

Pacific Rock Co., Los Angeles, Calif., has been incorporated for $250,000 by J. F. Walsh, E. R. Bush, Maude E. Bush, J. B. Stevens, and Medora L. Stevens.

Concrete Products Corp. of California, Monrovia, Calif., has been incorporated for $50,000 by J. H. Bartle, G. B. Kalb, and C. H. Price, all of Monrovia.

Pacific Art Tile and Stone Manufacturers, Los Angeles, Calif., have been incorporated for $100,000 by E. A. Rasmussen, J. Smidt, and E. J. Rosenmayer.

Hutcheson's Sand and Stone Corp., Rochester, N. Y., has been incorporated for $10,000 by H. D. and M. E. Hutcheson. (Attorney W. T. Purchase, Newark, N. J.

North American Cement Corp., Wilmington, Del., has been incorporated for $100,000 to manufacture and sell portland cement. (Corporation Trust Co. of America.)

Glenwood Granite Co., Mountain Park, Okla., has been incorporated for $100,000 by W. M. Britton and E. L. Kern, both of Custer City, and C. D. Parsons, Mountain Park.

Castilla Silica Sand Co., Salt Lake City, Utah, has been incorporated for $50,000. Cyrus E. Dallin, president; W. D. Sutton, vice-president; Jacob Evans, secretary and treasurer.

Rocktile Manufacturing Co., 1619 Dime Bank Bldg., Detroit, Mich., has been incorporated to sell tile, stone, concrete, and concrete products, with a capital of $1000.

Art Tile Co., 200 15th street, St. Petersburg, Fla., has been incorporated for $25,000 to manufacture concrete tile. C. S. Moses, president; W. E. Wakeman, secretary.

Guarantee Block and Tile Co., St. Paul, Minn., has been incorporated for $25,000 by Alex. A. Fischbach, 497 Omaha street, and Steve Skorish, 333 Third avenue South.

Woodbine Concrete Products Co., Colgate P. O., Baltimore County, Md., has been incorporated for $50,000 by John M. Lowrey, Fred L. Pfeffer, and Stanley Leroy Richardson.

Harry Aronoff, 2281 Douglass street, Brooklyn, N. Y., has been incorporated for $5000 to make cement and brick tile. Directors: Leo Linker, Philip Simon, 50 Court street, and Harry Aronoff.

City Sand Co., Iowa City, Iowa, has been incorporated for $10,000. Directors: Joseph P. Langford, Davenport, president; R. L. Murray, Iowa City, secretary, and M. R. Langford, Davenport.

Capital Sand and Gravel Co., Brooklyn, N. Y., has been incorporated for $50,000. Directors: Edward H. Dittman, 2813 Central avenue, Glendale; M. J. Reidy, 122 Baldwin avenue; F. E. Pearson, 12 Lembeck avenue, Jersey City, N. J. (Attorney, W. J. Miller, 60 Wall street, New York City.)

Whole House Tile and Brick Co., Davenport, Iowa, has been incorporated for $350,000 to manufacture brick, tile, etc. The location of the plant has not been announced, but headquarters for the company will be in Davenport. President and secretary, Andrew L. Chezem; vice-presidents, Henry Vollmer and W. E. Martin; treasurer, F. A. Johnson; plant manager, S. E. Johnson.

El Toro Silica Co., 146 Berkeley avenue, Pasadena, Calif., with deposits at El Toro, has been incorporated for $150,000, to produce daily 300 tons of silica sand for glass and other uses; also a byproduct—clay. Directors: H. W. Soule, president; Philip N. Thomas, vice-president; T. H. Pletsch, secretary. Mr. Soule was for several years chief engineer of the Riverside Portland Cement Co., Riverside, Calif.

Sand and Gravel

Delaware Sand and Gravel Co., Muncie, Ind., has increased its capital from $25,000 to $30,000.

Dallas, Ore.—The Polk county court recently leased the county's gravel plant, 2½ miles south of Independence, to Cummings & LaPoint, the contractors who have been constructing the final unit of the west side highway near Monmouth.

Orange, Calif.—The municipal gravel beds, located on a six-acre site in the Santiago creek, immediately north of the East Chapman bridge, recently were leased for five years to George A. Simpson, Los Angeles, paving contractor, now engaged in carrying out Orange's $162,000 paving program.

Allison, Iowa.—At a special meeting of the board of supervisors the gravel pit on the R. A. Dennis farm southwest of here was purchased by the county. Gravel will be hauled for the extension of primary road No. 14 through Allison. The supervisors expect to let the contract for the work in a short time.

Standard Gravel Co., Inc., Murfreesboro, Ark., has completed the installation of a modern gravel washing, grading and crushing plant two and one-half miles east of Delight. A trial run was made recently, two cars being loaded while the machinery was being adjusted, and the last car was washed, graded, crushed and loaded in 30 minutes, it is stated.

Mt. Carmel Sand and Gravel Co., Mt. Carmel, Ill., reports a successful year and looks forward to a much better one. This company, of which Messrs. Baird & Seitz are proprietors, gives steady employment to a large force of workmen and supplies sand and gravel not only to practically all of the local contractors and builders, it is stated, but to many of the hard road contractors and others; also to the Southern Railway Co. Lately the company has been hampered by a car shortage, which is an indication that general business is getting better.

Quarries

Iron Mountain, Mich., is reported as having a $45,000 stone crushing plant under construction.

M. T. Hall, 2115 Rutland street, Houston, Texas, plans establishing a plant with a capacity for 10 to 15 tons of limestone per day.

France Stone Co., Toledo, Ohio, according to reports, is working longer hours and with renewed activity at its Middlepoint, Ohio, plant owing to an increased demand for crushed stone.

Harry L. Cawley, Chisholm, Minn., has been awarded the contract for 400 yd. of crushed rock at $3.65 a yard by the village council of Chisholm. The crushed rock will be used for different improvements which the council passed on at the last three meetings.

Benton Lime and Stone Co., Oak Harbor, Ohio, recently acquired the property of the old Rocky Ridge Lime and Stone Co. in Rocky Ridge. The Benton company was organized a few months ago and took over the property of the Benton Stone Co. at Limestone, Ohio.

Bethany Crushed Stone Co., Bethany, Mo., which is headed by Henry Rand, will supply the crushed rock to be used in paving the Jefferson highway through White Oak township. To furnish rock enough within the next 60 days to supply the White Oak contractors for a year, in accordance with the terms of a contract recently made, continuous work will be started this week at the Bethany quarry and rock crusher. Day and night work will be done at both of them. Mr. Rand estimates that he will be able to turn out between 250 and 300 tons of crushed rock each day of the two months.

American Oolitic Stone Co., Bloomington, Ind., has been sold at receivers' sale to the **Clear Creek Stone Co.** for $50,000 and will be placed in operation at once, according to reports. The former company was organized about two years ago by Willing Brothers, contractors of Bellevue, Ohio. More than $100,000 was put in a stone mill, and the company had an option on a large tract of stone land northeast of Bloomington, when financial difficulties were encountered following the failure of Willing Brothers in the contracting business. The Clear Creek company is one of the successful stone outfits of the Bloomington belt. Only a few years ago it bought the Bloomington-Bedford Stone Co.

Cement

Pacific Portland Cement Co., San Francisco, Calif., has begun operating its new plant at Redwood City, Calif., with a force of 300 men.

Cowell Cement Co., Byron, Calif., recently purchased about 4000 acres of land near Brentwood which will be converted into a big stock ranch.

Peerless Portland Cement Co., First National Bank building, Detroit, Mich., has completed plans for the erection of a two-story power house on West Jefferson street, estimated to cost $35,000, to be used for works operation in this section, and will proceed with the building at once.

Gypsum

United States Gypsum Co.'s works at Gypsum, Ohio, held its annual picnic at Gem beach recently, which was attended by more than 1500 employes and friends. The plant at Gypsum was closed for the day.

United States Gypsum Co.'s Sweetwater, Texas, plant is now operating and is producing 150,000 sq. ft. of sheetrock wallboard and gyp-lap sheathing and 400 tons of plaster a day. H. D. Humphrey is manager of the works, F. J. Gaugh is superintendent, and A. M. Turner is chemist.

Rock Products Co., Reno, Nev., is about to enlarge its plant, putting in machinery for the manufacture of wall plaster, plaster of paris, and other gypsum products. A gypsum deposit near Mason has been purchased, and negotiations are under way for acquiring other deposits. The officers of the company are: C. E. Clough, president; Paul Butler, vice-president; Frank H. Norcross, secretary; T. O. Ward, treasurer.

Lime

Los Angeles Lime Co., Los Angeles, Calif., is about to erect a two-room warehouse, 31x120 ft., at 1307 McCollum street, to cost $3500.

Concrete Products

Escambia Sand and Gravel Corp., Flomaton, Ala., is about to establish a plant for the manufacture of concrete pipe.

Raymond Concrete Tile Co. has opened an office at 425 West building, Houston, Texas, with G. F. Weismann in charge as district manager.

E. W. Coons Co., Brooklyn, Hibbing, Minn., has begun operating the concrete block factory which has been idle since the dissolution of the McGovern-Wring Co.

Maximum Production—

with a minimum of help and operating cost is the result of careful planning and discriminating choice of equipment. When the cost of equipment runs into the thousands, all experimenting must be eliminated. The equipment chosen must be "right."

The Lutz Stone Company of Oshkosh, Wisconsin, holds an enviable position in its field for the economical and efficient operation of its quarry.

In spite of the fact that this concern ships from 550 to 650 tons per day, the number of employees numbers eight.

In common with all well designed and efficiently equipped plants, Allis-Chalmers Manufacturing Company furnished all the motors, as well as crushers, screens, elevators and hoists.

These pieces of equipment always assure exceptional service and economy. Ask the men who use them.

ALLIS-CHALMERS PRODUCTS
Electrical Machinery
Steam Turbines
Steam Engines
Gas and Oil Engines
Hydraulic Turbines
Crushing and Cement Machinery
Mining Machinery

ALLIS-CHALMERS MANUFACTURING COMPANY

MILWAUKEE, WISCONSIN. U.S.A.

ALLIS-CHALMERS PRODUCTS
Flour and Saw Mill Machinery
Power Transmission Machinery
Pumping Engines-Centrifugal Pumps
Steam and Electric Hoists
Air Compressors - Air Brakes
Agricultural Machinery
Condensers

Everlastone Products Corp., 828 West Pratt street, Baltimore, Md., has been damaged by fire.

Hardstone Brick and Engineering Co., South Park, St. Paul, Minn., will begin the erection of its factory this fall or early next spring.

Eureka Pressed Cement Brick Co., 413 American Bldg., Baltimore, Md., will establish a plant in Bevington, Md., for making brick and other concrete products.

Mike Zambito, 903 National road, Wheeling, W. Va., is operating a miniature factory for the manufacture of concrete building blocks. Mr. Zambito is a native Italian and was a miner at the No. 1 mine until recently when he began the construction of his factory. The process of building concrete blocks was taught him by his father while he was still a resident of Italy. The building is about 16x20 and contains machinery estimated to cost $1500. The machine is self-assembled, the parts having been secured from factories in Columbus, Fairmont and Pittsburgh. It is stated that the machine is unusual in its operation and furnishes a fertile field for exploration. With its giant clamps and massive weights it is able, so the report states, in less than a minute to transform a composition of sand and gravel and cement into a beautiful concrete building block 8x8x16 in. The blocks are turned out on the average of one every two minutes. The new process is expected to be a revival in the building material world. The blocks are now on sale at a price less than common ordinary building tile and those wishing carload lots will be given special prices, with a railroad siding available for loading the blocks at the place of construction.

Silica Sand

Juniata White Sand Co., Mapleton Depot, Penn., has sold out to the Pittsburgh White Sand Co., Mapleton.

Rock Asphalt

Albany-Decatur, Ala.—Asphalt mined at Wiggins Heights, about six miles south of the Twin Cities, will be manufactured, ready for the use of road builders early in 1925, stated L. D. Powell, **Southern Rock Asphalt Co.** here recently, following a successful tryout of local mined asphalt on the Somerville pike by William McCullough, who is building that pike for Morgan county.

North Manchester, Ind.—Two bids for the furnishing of 200 tons of Kentucky rock asphalt to be used in paving the road from North Manchester, Ind., to Liberty Mills were received by the county commissioners recently. John Williams agreed to furnish the material at $13.50 a ton and Francis Houlihan bid $13.25 a ton. Both men are of Wabash, Ind. Mr. Houlihan was awarded the contract.

Slag

Birmingham Slag Co., Birmingham, Ala., has preliminary plans under way for the rebuilding of its screening plant at Gadsden, Ala., recently destroyed by fire with loss approximating $37,000, including equipment, which will be replaced.

Phosphate Rock

Southern Phosphate Corp., Mulberry, Fla., is reported about to establish a phosphate rock mining plant on the site purchased several years ago near Haskell, Fla.

Mica

Star Mica Co., Heflin, Ala., has been organized with J. Cohue, president; J. M. Leesman, general manager, and will develop a 160-acre mica deposit, to have a daily output of about 3000 lb.

Personals

James Hutto has been appointed special representative of the Dewey Portland Cement Co., with headquarters in Kansas City, Mo.

George E. Nicholson of Kansas City, Mo., has disposed of his interests in the Yosemite Portland Cement Co., Merced, Calif., and has resigned as its president and director.

Major R. E. Hultz, junior vice commander of the local post of Veterans of Foreign Wars, has accepted a position as general manager of the Willoughby Sand and Gravel Co., Willoughby, Ohio.

George Patnoe, of the American Lime and Stone Co., who received a fracture of the leg several weeks ago while cranking his car in front of the company office and was squeezed when the car started forward pinning him against the building, is slowly recovering in the Bellefonte hospital and will soon be able to leave that institution.

George E. Pierson, formerly sales manager of the Atlas Cement Co. at Independence, Kans., recently resigned his position and has accepted a similar one with the International Cement Co., with headquarters in Kansas City. Mr. Pierson will have charge of the Kansas district and will assume his new duties about the middle of September.

Manufacturers

Link-Belt Co., Chicago, Ill., plans to have its exhibition at the American Mining Congress, Sacramento, Calif., September 29-October 4, one of those outstanding for interest. It intends to erect and have in operation one of its new vibrating screens, as well as various other displays of its equipment. The exhibit will be in charge of Mr. Shirley of the Link-Belt Meese & Gottfried Co., who will be assisted by Mr. Strube, engineer from the Link-Belt Philadelphia works.

Trade Literature

Atlas Powder Co., Wilmington, Del. Folder briefly describing the company's line of blasting supplies for use with every form of explosives.

Easton Car and Construction Co., Easton, Penn. Bulletin 21 on quarry cars, illustrating some of the types of quarry cars made by this company.

Dust Recovering and Conveying Co., Cleveland, Ohio. Bulletin 511 describing a small "Dracco" pneumatic conveying installation transporting a stream of material through a small-diameter pipe line in a chemical plant.

Hindley Gear Co., 1105 Frankford avenue, Philadelphia, Penn. Catalog 6, listing Hindley worm and spiral gears; straight hobs; spur, miter, and bevel gears; housings or casings for worm-gears; screws, lead, power, and feed.

Good Roads Machinery Co., Inc., Kennett square, Penn., has recently issued a mailing piece, showing the line of equipment that it manufactures, including "Climax" and "Champion" rock crushers, elevators, conveyors, screens, and bins.

Standard Conveyor Co., North St. Paul, Minn. Catalog 1, a well-prepared, made up, and printed booklet, showing some of the many ways of harnessing gravity to industrial needs, giving typical applications of this company's gravity roller conveyor, and describing the various types of rollers in their relation to different kinds of loads.

Aldrich Pump Co., Allentown, Penn. Pump Data 50, giving several pages of engineering tables and other useful information. Diagrams of input power and discharge flow for various types of pumps are given, and a table of decimal equivalents of 64th's is also included. Pump Data 82 on high-pressure road pumps, describing and illustrating the Nos. 4, 5, and 6 units.

Denver Rock Drill Manufacturing Co., Denver, Colo., has issued a circular on Leadville hoists for use in mines and quarries. Also a bulletin on the No. 37 "Turbro Waughammer," illustrating and describing this equipment in detail. Model 337 Waugh Turbro Drifter is also mentioned as well as other equipment manufactured by this company.

Allis-Chalmers Manufacturing Co., Milwaukee, Wis. Illustrated Bulletin 1460 on the compensated type shaking screens. A list of parts numbered and named is given for ready reference in ordering repair parts. Bulletin 1461 illustrates and describes the McCully fine-reduction gyratory crusher. A number of tables of specifications are included.

American Blower Co., Detroit, Mich. Bulletin 1101 on the "Sirocco" single- and double-inlet wheel, designed to meet a great variety of needs, such as heating factory buildings, cooling gasoline engines, etc. Bulletin 1103 describing in detail and illustrating the company's high-speed fans. There are several capacity tables, as well as tables of sizes and specifications.

W. A. Jones Foundry and Machine Co., 4401 West Roosevelt road, Chicago, Ill., has just issued Catalog 29 entitled, "Jones Gears," describing and illustrating the gears made by this company, from giant gears to small pinions. The catalog contains 224 pages of specific detailed information, including tables of dimensions, and will be sent gratis to those interested.

Besser Sales Co., Monadnock building, Chicago, Ill. Catalog in looseleaf form nicely bound in an attractive cover, describing the company's line of concrete products machinery, including the single and double automatic face-down block machine; Nos. 1 and 2 brick machines; continuous mixer; semi-automatic brick machine; hand block and tile machines; power tamper, etc. There are also a number of testimonial letters reproduced.

Thew Shovel Co., Lorain, Ohio. Bulletin 271 describing and illustrating the Type O gasoline shovel. A working-range table is included. A mailing piece being mailed by this company to shovel buyers throughout the country deserves mention, as it is an excellent piece of work, describing the plan and execution of the Niagara new waterway project. A number of views are shown, together with a cross-section of the tunnel project. Anyone interested may obtain a copy by writing to the company.

Koehring Co., Milwaukee, Wis., has just issued a 20-page booklet listing the complete line of products manufactured by this company; namely, pavers, trailers, construction mixers, "Dandie" light mixers, bar benders, bar cutters, gasoline cranes, draglines, and gasoline shovels. The booklet is made in pocket size for handy reference and has a post card in the back for the convenience of those interested. A copy may be had by writing to the company.

Morse Chain Co., Ithaca, N. Y. Publication 24 on large power drives, and publication 26 on small power drives, both of which describe Morse drives in detail and show a number of installation illustrations. Both publications include a data sheet. "A Chain of Testimonials" is the title of another circular, which, as its name implies, is a symposium of statements from executives. In each case an actual photograph of the chain drive, or drives, is shown, together with a quoted report by an official of the plant in question.

E. I. du Pont de Nemours & Co., Wilmington, Del., is issuing a series of "Explosives Service Bulletins" which, according to the manufacturer, aim to give to explosives consumers the most thorough information on how to secure the best results in blasting. Among the bulletins issued to date are: "Safety Fuse," "Firing Quarry Shots," "Getting the Best Results with Permissible Explosives," "Velocity of Detonation of Various Types of Explosive," and "Secondary Blasting," by J. B. Stoneking, giving a few pointers for efficiency and economy in this work.

General Refractories Co., Philadelphia, Penn. Catalog on the various products manufactured by this company, such as fireclay, silica, magnesite, and chrome brick; dead-burned magnesite; magnesite cement or fused magnesite; lump or ground chrome ore; chrome cement; ground ganister; silica cement; ground fireclay, etc. A number of pages are devoted to illustrating the different shapes and sizes of brick, and there are many tables of specifications, as well as temperature tables, tables of weights of various materials, and mensuration tables. An index for quick reference is included.

Stephens-Adamson Manufacturing Co., Aurora, Ill., has just issued its latest Catalog 27, containing 224 pages, which is a treatise completely cataloging its chains, sprockets and gears. The technical matter which is presented in conjunction with the dimension and price lists has been produced with great care, and the manufacturers claim that there are some new and unique features that will command the attention of those who use this class of equipment. The thorough manner in which this material has been collected, and the comprehensive and intelligent arrangement of data deserves mention. Requests for copies should be sent to the company on business stationery giving information concerning the placement of these catalogs.

Morse Chain Co., Ithaca, N. Y., has issued one of the most interesting little books that have come to Rock Products notice. It is a 46-page pamphlet entitled "Power," and is a reprint of an address delivered by F. L. Morse, at the Milwaukee Mining Congress, and it takes up applications of power from 3000 B. C. to the present date. Much of its value is in the illustrations which must represent a long period of study and research to bring together. It is astonishing to find that chain pumps were in use in 225 B. C., that the aerial tramways were in use in 1438 and that the steam turbine was described in 1629. Roller bearings, considered a highly modern development, were in use in 1588. The author says in a final note that the work is only commenced and that he will appreciate photographs or references to early devices, especially those relative to early developments in the United States.